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U S Department of Agriculture
Forest Service
Lewis & Clark & Flathead
National Forests

ENVIRONMENTAL ASSESSMENT

PROSPECTING PERMIT APPLICATION

CONSOLIDATED GEOREX GEOPHYSICS

PLEASE RETURN

April 1980

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Decision Notice

and

Finding of No Significant Impact

Seismograph Permit

USDA Forest Service
Northern Region

I. Decision

It is my decision to approve the applied for permit for those areas outside of the wilderness areas and not consider the application for those lines or segments of lines inside the wildernesses. This decision is displayed in Alternative 3 of the enclosed environmental assessment. The approved permits will be issued by the Flathead and Lewis and Clark National Forests with special operating procedures discussed in the environmental assessment.

II. Rationale

The authority to grant or deny the permit applied for by CGG rests solely with the Forest Service since no application has been made under the laws of the United States pertaining to mineral leasing. The Forest Service authority regarding surface uses of the National Forest is contained in the Organic Administration Act of 1897, the Multiple Use and Sustained Yield Act of 1960, and the Forest and Rangeland Renewable Resources Act of 1974. In addition to this general authority, before the Forest Service can authorize surface uses in a National Forest wilderness, the Forest Service must comply with provisions of the Wilderness Act of 1964.

The National Forests are managed for multiple use and sustained yield of resources. Minerals are among the multiple uses. The wilderness resource is another. In situations where the competing interests of multiple resources may conflict and one resource is specifically discussed in the law, it seems only prudent when discretion rests with the agency, that the conflict should be avoided unless clear and specific rights are provided for under the law which would necessitate a resolution of the conflict. Therefore, in accordance with my general legal authority pertaining to surface uses, it is my policy to not consider any proposal for mineral activities within a National Forest wilderness unless the proposal is being specifically applied for under the United States Mining Laws or laws pertaining to mineral leasing and regulations promulgated thereunder. I am adopting this policy not unmindful of recent events which have focused our National attention and interest in matters related to the mineral and energy needs of this country. Certainly, it is the responsibility of the Forest Service to be responsive to these needs. However, it is my belief when competing interests are involved that these needs should be addressed only in that manner clearly within the intent of Congress.

III. Environmental Considerations Used in the Decisionmaking

Areas Lying Outside of Wildernesses:

All physical, biological, social, and economic factors were considered in making this decision. Based on the available data, it has been determined there would be no physical effects of consequence. There could be biological effects resulting from the proposed activities, but they can be mitigated as discussed in the environmental assessment. Of special concern were the threatened and endangered species of the area. The social and economic effects of the proposal were not of consequence.

Areas Lying Within Wildernesses:

Potential environmental effects as well as social and economic effects may result from this proposal. Since my policy has been adopted to avoid these potential effects, unless a resolution is clearly required under the law, an analysis of environmental, social, and economic considerations has not been necessary in reaching my decision.

IV. Finding of No Significant Impact

I have determined through the environmental analysis that this is not a major Federal action that would significantly affect the quality of the human environment. Therefore, an environmental impact statement is not needed. This determination was based upon consideration of the following factors which are discussed in detail in the environmental assessment: physical, biological, economic, and social effects; especially, as discussed in Alternative 2. The environmental assessment is available for review at the Regional Office, and Flathead and Lewis and Clark Supervisors' Offices.

Tom Coston
TOM COSTON
Regional Forester

4/17/80
(Date)

ENVIRONMENTAL ASSESSMENT

APRIL 1980

PROSPECTING PERMIT APPLICATION
CONSOLIDATED GEOREX GEOPHYSICS

LEWIS & CLARK AND FLATHEAD NATIONAL FORESTS

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Missoula, Montana

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1. INTRODUCTION

A. The Seismic Exploration Proposal

On July 2, 1979, the Northern Regional Forester received a prospecting permit application from Consolidated Georex Geophysics (CGG) to conduct a helicopter-portable, surface-charge seismic investigation for oil and gas within the Flathead and Lewis & Clark National Forests. The application is for five seismic lines totaling about 207 miles, with a requested starting time during the summer of 1980 and lasting about 3 months. As proposed the seismic lines would cover about 161 miles within the Bob Marshall, Great Bear, and Scapegoat Wildernesses and about 46 miles in adjacent nonwilderness land (Figure 1).

The objectives of the proposed seismic exploration are:

1. To gather seismic data of sufficient detail and precision to permit an analysis of the subsurface geologic structure along the lines of survey, and to determine areas with geologic characteristics favorable for the accumulation and entrapment of natural gas.
2. To gather seismic data which will permit a better interpretation of the regional geology and improve knowledge of the geologic evolution of the Northern Montana Overthrust Belt.

This type of regional seismic survey can provide an improved understanding of the geologic structures and hydrocarbon potential of an area much larger than that encompassed by the proposed seismic lines. To accomplish this objective however, the seismic lines must be of sufficient length and distribution to reflect the changing character of the subsurface geology, and they must be interconnected to permit accurate correlation of geologic features between the seismic lines.

An active, ongoing seismic exploration program is being conducted by several companies in the adjacent, nonwilderness lands east of the Bob Marshall and Great Bear Wildernesses. One current survey is regional in scope, traverses private and tribal lands, and terminates east of the National Forest Boundary. The remaining surveys consist of relatively short seismic lines which are typically not interconnected. The regional survey as proposed by CGG would constitute an integration and extention of these surveys.

Although the application was made to the Regional Forester the environmental analysis was conducted by the National Forests responsible for managing the lands specified in the application (FSM 2821.2). In November 1979, a joint Flathead and Lewis & Clark National Forests environmental analysis was started. Results of the analysis are discussed in this document.

The proposed method of seismic exploration consists of detonating a series of 50 lb. "shots" composed of 10 five pound explosive charges each affixed to a 30 inch wooden lath. About 16 "shots" are required per mile of seismic line or a total of about 800 lb. of explosives per mile.

This seismic method requires a field crew of 29 individuals, and the use of two helicopters to provide daily transportation for the crew, equipment, and supplies. The helicopters must also transport a dome-shaped, seismic-data recording module to locations every 5 miles along the seismic lines.

Previous geologic exploration in the area consists largely of mapping surface geology and a few geophysical investigations (aeromagnetic and gravity studies). The most detailed geologic mapping and interpretation available was published by the U. S. Geological Survey (Mudge and others, 1978. U. S. Geol. Survey Open-File Rept. 78-295). This report concluded that "much more detailed geologic data including seismic surveys and drilling are necessary to more fully evaluate and delimit areas with hydrocarbon potential."

B. Nature of the Decision to be Made

Upon receiving a prospecting permit application the Forest Service must conduct an environmental analysis (FSM 1950); determine if the permit would be in conflict with other licences, leases, and permits or regulations; and if no unresolved problems remain, approve the application and prepare necessary clauses to protect surface resources (FSM 2821.2). A prospecting permit may be issued for all lands in the National Forest System. However, a permit should not ordinarily be issued on lands withdrawn from mineral leasing except where satisfactory completion of regional surveys would be infeasible (FSM 2821.1).

As a surface management agency, the Forest Service has authority to ensure mineral activities on National Forest lands are conducted in a way to minimize conflicts with other uses and damage to surface resources, and that damaged areas are rehabilited after mineral operations. The Forest Services authority for managing the surface resources and uses is in the Organic Administration Act of June 4, 1897, as ammended, the Multiple Use-Sustained Yield Act of 1960, and the Forest and Rangeland Renewable Resource Planning Act of 1974, as ammended (FSM 2821.01).

Forest Supervisors are authorized to issue prospecting permits (FSM 2821.04). However, because the approval of mechanized equipment use within wilderness is an integral part of the decision, authority is retained by the Regional Forester (FSM 2323.71a).

Although seismic prospecting has not been previously conducted within wildernesses, provisions for this kind of exploration are addressed in the Wilderness Act of 1964.

The Wilderness Act of 1964, Sec. 4(d):

> (2) "Nothing in this Act shall prevent within National Forest wilderness areas any activity, including prospecting, for the purpose of gathering information about minerals or other resources, if such activity is carried on in a manner compatible with the preservation of the wilderness environment."

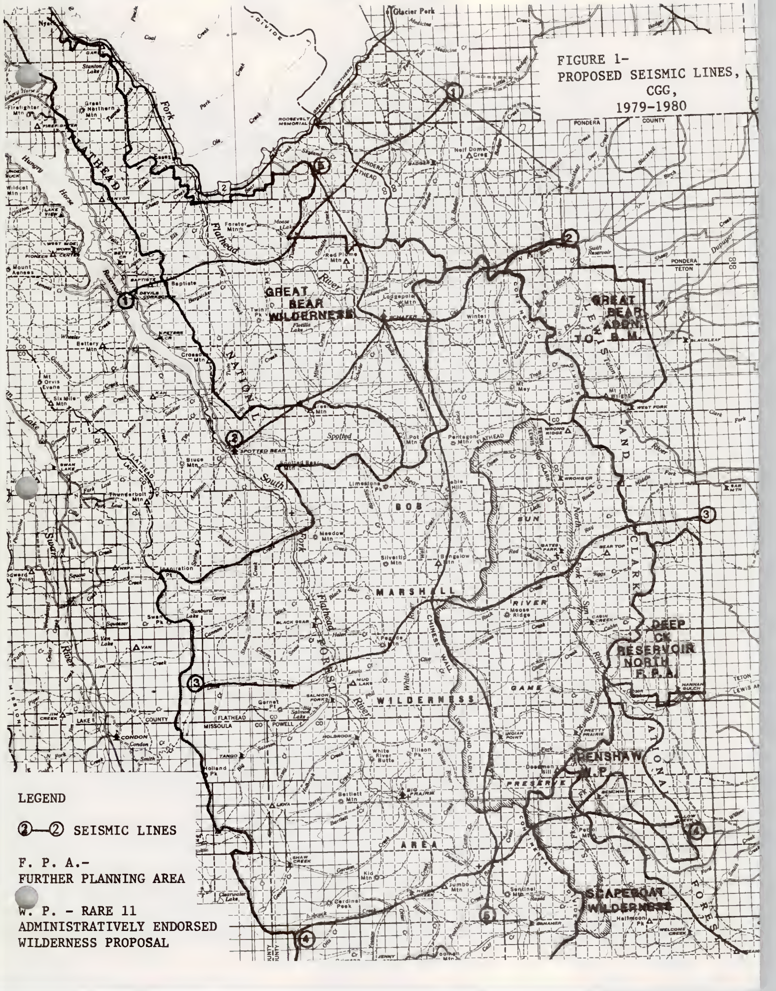


FIGURE 1-
PROPOSED SEISMIC LINES,
CGG,
1979-1980

LEGEND

②—② SEISMIC LINES

F. P. A.-
FURTHER PLANNING AREA

W. P. - RARE 11
ADMINISTRATIVELY ENDORSED
WILDERNESS PROPOSAL

> (3) "Not withstanding any other provisions of this Act, until midnight December 31, 1983, the United States mining laws and all laws pertaining to mineral leasing shall, to the same extent as applicable prior to the effective date of this act, extend to those National Forest Lands designated by this Act as "wilderness areas"; subject, however, to such reasonable regulations govering ingress and egress as may be prescribed by the Secretary of Agriculture consistent with the use of the land for mineral location and development, and exploration, drilling, and production... ..., including where essential the use of mechanized ground or air equipment and restoration as near as practicable of the surface of the land disturbed in performing prospecting, location, and, in oil and gas leasing, discovery work, exploration, drilling, and production, as soon as they have served their purpose."

The Forest Service Manual (FSM) provides the regulations and guidance for establishing if the use of mechanized equipment is "essential". Central to this determination are the following excerpts from FSM 2323.71:

> "2. Access to Prospect. Access to a prospect may be planned by foot, horseback, road, cross-country vehicles, boat, or aircraft. From the wilderness resource standpoint, foot or horseback is the most preferable and this approach should be considered first. However, this may be impractical from the standpoint of the requirements of the prospect plan... The final approved method must be that which creates the least lasting impact on the wilderness resources while still reasonably serving the needs of the prospect. In some cases, consideration for the least lasting effect might override another form of access which have more short-term impacts.
>
> Those activities otherwise generally prohibited in wilderness, including the use of mechanized transport, motorized equipment, or aircraft, shall be authorized only when proved essential...
>
> a. When considering the use of motorized equipment as the means of access, the following criteria shall be used in arriving at a decision:
>
> (1) Forest Supervisors, by and with the advise of the Regional mineral examiners, who shall make such investigations as may be appropriate, shall determine that there is reasonable expectation of the presence of a mineral deposit.
>
> (2) There is no reasonable alternative to the use of motorized or mechanical equipment.
>
> (3) When authorized, the use of motorized or mechanical equipment should be timed to have the minimum possible impact on wilderness visitors' enjoyment.

b. The transportation of prospecting personnel by helicopter or other form of motorized transport may be approved after a satisfactory showing of need based on the following criteria:

(1) Aerial overflight, study of available geological information, aeromagnetic surveys, or other reconnaissance activities indicate that ground study is warranted.

(2) A prospector of average physical ability cannot, with the expenditure of not more than 2 hours nonmotorized travel time (one way), commute to the area being prospected from a reasonably accessible campsite. Terms in these criteria are further defined as follows:

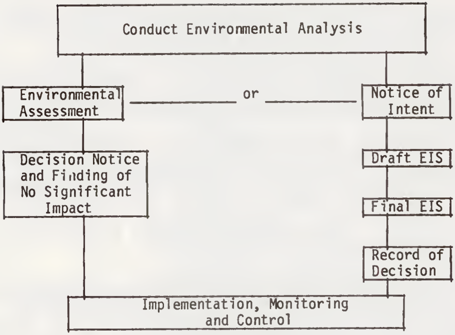
(a) Campsite. Any site with adequate water where a temporary tent camp can be established and maintained.

(b) Reasonably Accessible Campsite. This is any campsite which is either reasonably accessible by packhorse from any Forest Service transportation system trail which in itself is suitable for packhorse travel, or if not reasonably accessible by packhorse from such a trail it can be reached by packhorse in not over 1 day's travel time from the nearest road. Because system trails often deliberately bypass campsites, the term "reasonably accessible" has been used to provide flexibility in local conditions. However, a campsite will normally not be considered to be reasonably accessible from a trail if it is more than 1 hour's travel time off the system trail."

C. The Analysis Process

Analysis of the issues and concerns, formulation of evaluation criteria, and identification of alternatives, as well as the site-specific analysis of possible environmental impacts, was conducted by an interdisciplinary team (I.D. Team). This environmental document is a record of the analysis process. The team and work groups within the team had periodic meetings, analyzed data, and compiled this report from November 1979 through March 1980. Forest Service resource specialist's and the Montana Department of Fish, Wildlife, and Parks provided information which was used by the I.D. Team in this analysis. The membership of the I.D. Team is listed in Appendix B.

The environmental analysis conforms with the Forest Service National Environmental Policy Act (NEPA) Process; Implementation Procedures, 1979 (FSM 1950). The usual relationships between the environmental analysis, the environmental documents, and implementation are shown in the following diagram:


Conduct Environmental Analysis
Environmental Assessment
or
Notice of Intent
Decision Notice and Finding of No Significant Impact
Draft EIS
Final EIS
Record of Decision
Implementation, Monitoring and Control

The decision notice shall not be signed and dated until after the finding of no significant impact has been available for public review for a 30-day period (including State and areawide clearinghouses) when: (1) the proposed action is, or is closely similar to one which normally requires preparation of an EIS, or (2) the nature of the proposed action is without precedent. In these cases, the decision notice constitutes the final determination that an EIS is not needed (FSM 1953.21).

Data used in the environmental analysis is on file at the Supervisor's Offices of the Flathead and Lewis & Clark National Forests. Additional data was obtained from Montana State Fish, Wildlife, and Parks.

D. Issues and Management Concerns

In mid-November, the Forest Service conducted two public information meetings, gave background information to the area's news media, and met with many groups and individuals. Written and verbal comments helped the ID Team determine the issues, management concerns, and alternatives that were analyzed to make a decision on the permit (see Sec. 9 - Consultation with Others).

The issues and management concerns identified are:

*Will this proposal lead to further exploration and development?

*Does the proposed seismic exploration:
  -Meet existing statutes and Forest Service Policy?
  -Conform with the public's perception of wilderness uses?

*Does the proposed seismic exploration provide for an orderly and timely evaluation of the Nation's potential energy resources?

*What effects would the proposed seismic exploration have:
  - On threatened or endangered species (grizzly bear, and gray wolf) and on big game (elk, moose, bighorn sheep & mountain goats) and fish?
  - On the area's vegetation and the soil-air-water system?

*What effects would occur if mechanized equipment were not used?

*What effects would the noise from explosives and helicopters have on:
  - Recreational use of the wilderness?
  - Safety of wilderness user?

*What potential fire hazards are involved with the proposed type of seismic exploration?

*Is the proposed action within the Forest Service's capability to implement and administer?

E. Previous Environmental Analyses

The Bob Marshall Wilderness Plan (1972) established general management guidance to seismic exploration. This plan is also used as general management guidance for the adjacent Great Bear and Scapegoat Wildernesses. The plan acknowledged that the U. S. Geological Survey and U. S. Bureau of Mines studies, then underway, could result in future minerals activity within the area and that future minerals activity would be evaluated under the National Environmental Policy Act (NEPA) and the Wilderness Act. No discussion of access methods or the use of motorized equipment for minerals activity was included in this plan.

The Forest Multiple Use Plans, Part I prepared in 1974 provided coordinating requirements establishing relationships that are to be maintained between resources, uses, activities, and ecological systems on the Forest. Multiple Use Zone mapping has delineated High Area, General and Dry Forest, Lower Slope Foothill, Water Influence, and Travel Influence Zones. On the Lewis and Clark National Forest for all zones, the coordinating requirements provide that oil and gas activity including seismic exploration may be permitted if that activity is compatible with the findings of an environment analysis. On the Flathead National Forest, the plan recognized the potential for such activities but no coordinating requirements were developed.

In 1976, the Flathead National Forest prepared a Final Environmental Statement (FES) on Oil and Gas Lease Application, Exploration, and Development. This FES was appealed to the Regional Forester and the planning was terminated.

In 1977, the Rocky Mountain Front Draft Environmental Impact Statement was released. This planning effort was discontinued prior to completion.

The nationwide Roadless Area Review and Evaluation (RARE II), initiated in 1977 and finalized in 1979 (RARE II, FES, 1979), allocated roadless lands to "nonwilderness", "further planning," and "wilderness." Most of the RARE II lands traversed by the proposed seismic lines were allocated to "nonwilderness" but about 2 miles of line 4 crosses a portion of an area allocated to "wilderness" (Renshaw Mountain).

Both the Scapegoat Wilderness Proposal (1971) and the Great Bear Wilderness Proposal (1978) discuss the mineral resources and potential minerals activity within these areas. Secretary of Agriculture Bob Bergland, writing in behalf of the President, in his letter of transmittal to Congress on the Great Bear Wilderness Study Area, acknowledged the high gas and oil potential of the area and stated: "The Administration concludes, however, that the wilderness values of the area outweigh the gas and oil potentials at this time, and should be given priority" (Aug. 11, 1978). However, all land and minerals management requirements established for these areas are based on the Wilderness Act of 1964 and the Bob Marshall Wilderness Plan (1972).

Within the analysis area, the South Fork and Middle Fork of the Flathead River are classified as "wild" under the National Wild and Scenic Rivers Act. The river corridor, approximately 1/4 mile on each side of the river, is withdrawn from all mineral entry. This withdrawal does not exclude exploration if done in a manner which is compatible with preservation of the character of the river system.

2. AFFECTED ENVIRONMENT

A. Physical Environment

Physiography

The proposed seismic lines are located on National Forest lands within the Spotted Bear and Hungry Horse Ranger Districts of the Flathead National Forest and the Rocky Mountain Ranger District of the Lewis & Clark National Forest. This land area is about 110 miles long in a north-south direction and a maximum of about 47 miles wide. Much of this area lies within the Bob Marshall, Great Bear, and Scapegoat Wildernesses which comprise about 3,000 square miles.

The scenery of the area is spectacular. Deep valleys eroded by streams and sculpted by glaciers result in narrow, inaccessible ridges and steep valley sides. The Continental Divide extends southward from Glacier Park and extends through the eastern part of the area. There are broad expanses of alpine and subalpine country with perennial snowfields, sparce vegetation, and steep and rocky terrain. Interspersed are many broad mountain valleys with some heavy stands of timber and scattered mountain meadows and parks.

The most noted scenic feature in the Bob Marshall Wilderness is the Chinese Wall which lies along the Continental Divide. This prominent cliff of Cambrian rocks has as much as 1,000 feet of relief and extends about 30 miles. Elsewhere scenic peaks reach elevations of 7,000 to 9,270 feet. Total relief is about 4,000 feet.

The principal rivers draining the area are the Two Medicine, Teton, Sun, Spotted Bear and South Fork and Middle Fork of the Flathead. There are frequent lakes west of the Continental Divide.

Geology

The area is geologically divisible into two areas of contrasting rock type, geologic structure, and geologic age. The Continental Divide generally separates these two areas.

East of the Divide the area is within the disturbed or overthrust belt of Northern Montana. Here the Sawtooth and eastern part of the Lewis & Clark ranges typically consist of limestones, sandstones, and shales of Paleozoic and Mesozoic age which have been complexly folded and repeated by several west-dipping thrust faults (Mudge, 1972a, 1972b; Mudge and others, 1977, 1978). The prominent north-trending valley and ridge character of this area results from the fault-repetition of Paleozoic limestone ridges with intervening valleys underlain by Mesozoic age sandstones and shales capped with a thin mantle of glacial drift and alluvium.

The area west of the Divide consists mostly of ancient, Precambrian Age Belt Supergroups sedimentary rocks which are deformed by northerly-trending normal faults and broad, open folds. These Beltian rocks overlie a major, low-angle thrust fault, the Lewis Overthrust. This thrust fault is at least 135 miles long; dips gently westward from its surface trace near the Continental Divide; and extends at least as far westward as the Flathead Valley (Hume, 1957). The Beltian rocks have been thrust eastward overriding younger Paleozoic and Mesozoic age rocks.

The following are fundamental aspects of hydrocarbon potential of the area. The Paleozoic and Mesozoic Age rocks contain beds which have been capable of generating (source rocks) and trapping (reservoir rocks) natural gas. The depth and timing of subthrust fault-burial of the source rock (thermal history) has had an important but imperfectly known influence on the amount and location of natural gas generation. The structural configuration of the Lewis Thrust has controlled the westward extent of natural gas generation.

On the basis of surface mapping techniques and gravity studies the U. S. Geological Survey has completed a generalized evaluation of the hydrocarbon (natural gas) potential of the area (Mudge and other, 1978) Figure 2 illustrates the zones of inferred high, medium, and low potential.

B. Biologic Environment

Vegetation

Vegetation along the proposed seismic lines varies greatly. In the eastern part of the area the landscape is dominated by sparsely forested, steep rocky ridges and relatively narrow valleys. Moving into the wilderness, much of the lower lands are heavily forested while at the upper elevations subalpine vegetation dominates. Crossing the rugged Continental Divide the vegetation becomes more dense: Larch, Douglas-fir, and sub-alpine fir dominate the slopes, while in the bottom lands spruce and ponderosa pine are found. Scattered throughout the area, about 1/3 of the climax trees have been replaced by lodgepole pine as a result of wildfire.

Threatened and Endangered Species

Species protected by the Endangered Species Act of 1973 which are known to inhabit the area include the grizzly bear (threatened) and the gray wolf (endangered). No bald eagle or peregrine falcon nests are known to occur along the proposed seismic lines although they do occur in the study area (Holland, 1980).

1. Grizzly Bear

According to population estimates and sightings (Schallenberger, Montana Dept. of Fish, Wildlife and Parks) there appears to be a healthy population of grizzly which may be near its carrying capacity

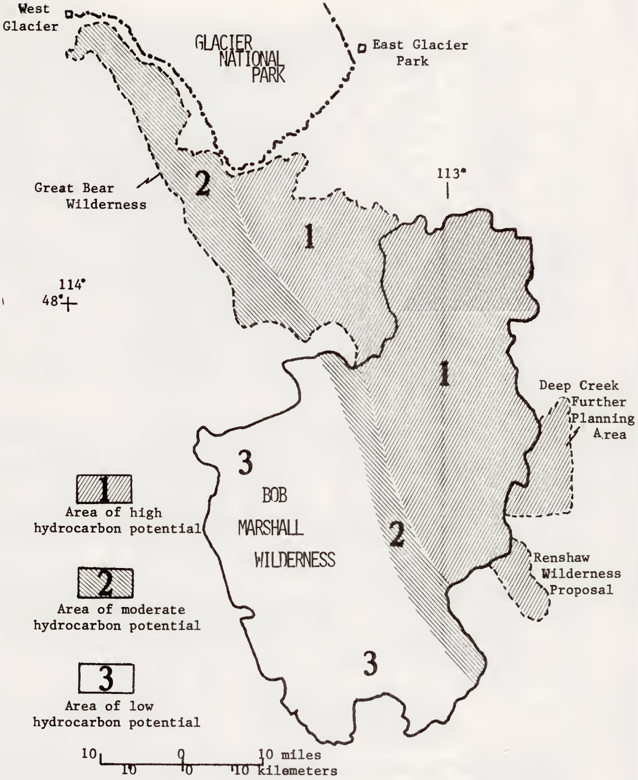

West Glacier
GLACIER NATIONAL PARK
East Glacier Park
Great Bear Wilderness
113°
114°
48°
2
1
1
3
2
3
BOB MARSHALL WILDERNESS
Deep Creek Further Planning Area
Renshaw Wilderness Proposal
1 Area of high hydrocarbon potential
2 Area of moderate hydrocarbon potential
3 Area of low hydrocarbon potential
10 0 10 miles
10 0 10 kilemeters

Figure 2--Hydrocarbon potential of the Bob Marshall and Great Bear Wildernesses. (after Mudge & Others, 1978) for the Northern Rocky Mountain Front east of the Continental Divide. However, more recent population studies have been conducted by the Border Grizzly Project and were presented by Chris Servheen (Research Biologist) at the Grizzly Bear Recovery Meeting on Feb. 26-27, 1980 in Missoula. These studies indicate that the overall population of grizzly within the Bob Marshall Ecosystem* is declining. Based on an estimated population of 279 bears over an 8746 square mile area there is one bear per 31 square miles within the Bob Marshall Ecosystem. Harvest of grizzlies by licensed hunters is permitted on a quota-based hunting season throughout the area except in the Sun River Game Preserve which is closed to all hunting.

Diversity is an important characteristic of grizzly habitat (Scaggs, 1979). The abundance of avalanche chutes, stream bottoms, wet meadows, burns, sidehill parks, subalpine parks, and a variety of forested habitat types characteristic of the area give the grizzly a broad range of habitats for use on a seasonal basis as important foods become available (Meaey, 1977).

Female and young grizzlies in the area have fairly restricted ranges (less than 50 square miles), while male bears are more transient and may travel great distances (30-100 miles) throughout their home range (Evans, 1972).

2. Gray Wolf

Evidence of gray wolf presence (scat and tracks) and wolf sightings have occurred in and around the study area. Little is known of wolf population levels in the area but Mattson (1979) estimate that there are 5-8 wolves in the Rocky Mountain Front area.

The gray wolf is a widely dispersed and mobile species (Holland, 1980). The wolf's prey base is the areas large herds of elk and abundant deer.

3. Sensitive Time Periods

There are certain seasons or periods during the year when wildlife is more sensitive to disturbance than at other times. Threatened or endangered species which occupy the area or for which there is suitable, unoccupied habitat have identified sensitive periods as follows (Holland, 1980):

Grizzly Bear Spring Foraging	3/1-7/1
Grizzly Bear Denning Period	11/15-5/10
Bald Eagle Nesting Period	4/1-7/1
Peregrine Falcon Nesting Period	4/1-7-1

---

*Bob Marshall Ecosystem includes: Whitefish Range, Glacier National Park, parts of the Blackfoot Indian Reservation, Great Bear Wilderness, Mission Mountain Wilderness, parts of Flathead Indian Reservation, Bob Marshall Wilderness, Scapegoat Wilderness, Rocky Mountain Front; parts of Helena, Lewis & Clark, Lolo, Flathead and Kootenai National Forest contiguous to the above; and small segments of private lands, State land and Bureau of Land Management lands within, adjacent to or near the above areas.

Big Game

All Montana's big game species, except antelope, can be found within the area. Elk, mule deer, white-tailed deer, and black bear are all common. Lesser numbers of moose, mountain goats, mountain sheep and mountain lions are also present.

A variety of physical factors such as topography, slope, aspect, climate, and fire combine to determine the quality and quantity of wildlife habitat. These habitat components are variable with time and are constantly changing in response to changing physical factors as well as the influences of human activity and development.

On the east side, the effects of wind are a very important factor in determing big game winter range. Natural grasslands which are exposed to the prevailing winds afford most of the available winter range. The most important winter ranges, as well as calving and lambing areas, are those south and southwest slopes which receive maximum benefit of solar radiation and the rapid melting by chinook winds (USFS, Rocky Mtn Front, DEIS, 1977). On the west side, the winter range is found along the lower south facing slopes of the Middle Fork and South Fork of the Flathead, the Dry Park area, and Spotted Bear River. Shrubs provide most of the winter food.

Range conditions throughout most of the study area are rated as good to excellent. In the past, competition between livestock and big game has resulted in deteriorated range conditions in some areas. Encroachment of conifers on old burns and meadows, coupled with fire suppression is gradually reducing the available game range over much of the study area (Mont. Dept. of Fish & Game, 1972).

Big game range quality continues to be a problem within the Sun River Game Preserve. This 199,661 acre game preserve located in the Lewis & Clark portion of the Bob Marshall and Scapegoat Wildernesses was created by the Montana State Legislature in 1913 and has been closed to hunting since that time. Prior to 1936, joint use of the area by cattle and wildlife resulted in overgrazing and many wildlife die-offs due to poor summer and winter ranges. The cattle were removed in 1950. In recent years large concentrations of elk remain in the Preserve to escape hunting pressure until deep snow, cold weather, and lack of forage force the elk to lower elevations (Mt Dept. of Fish & Game, 1972).

Big game wildlife inventory data on file in the Flathead and Lewis & Clark National Forests supplemented by data and observations made by the Montana Department of Fish, Wildlife, and Parks has been compiled by Holland (1980) to identify seasonal habitats used by various species along the routes of the proposed seismic investigation. A map of these habitats is available for review at the Lewis & Clark and Flathead National Forest Supervisor's Office.

The sensitivity periods for big game within the study area have been identified as follows:

Big Game Winter Range	11/1 to 5/1
Elk Calving Period	5/15 to 7/1
Bighorn Lambing Period	5/1 to 6/15
Mtn Goat Kidding Season	5/15 to 6/15
Elk Rutting Season	9/1 to 10/31
Bighorn Rutting Season	10/15 to 12/31
Hunting Season - Flathead NF	9/15 to 11/30
Hunting Season - L&C NF	10/1 to 11/30

Fish

Rainbow, brook, Dolly Varden, westslope cutthroat, and upper Missouri River cutthroat trout occupy the waters of the area.

East of the Continental Divide all named streams along the proposed seismic line #1 (North Fork Little Badger Creek, Whiterock Creek, South Fork Two Medicine Creek, Lost Shirt Creek, Benson Creek, and Woods Creek) and two creeks along seismic line #2 (North Fork Birch Creek and South Fork Badger Creek) contain populations of Upper Missouri cutthroat trout. This unique trout is considered a "Species of Special Concern," and these particular streams supporting this fish have been classified by the State of Montana as prime habitat with highest priority for consideration (Lloyd, 1980). This is defined as streams essential to the subspecies' well-being, and any habitat loss would result in their population decline. Each of these streams have been assigned a Fishery Resource Value Class of 2 (high priority for fishery value) by the Montana Dept. of Fish, Wildlife, and Parks (Lloyd, 1980).

The fishery in this area on the Flathead National Forest is unique since it is a spawning and nursery area for native Dolly Varden and westslope cutthroat trout. The importance of unrestricted fish passage from Flathead Lake into the Middle Fork and its tributaries and from Hungry Horse Reservoir into the South Fork and its tributaries cannot be over-emphasized. The Montana Department of Fish, Wildlife and Parks estimates that 45 percent of the recruitment for Flathead Lake fisheries comes from the Middle Fork.

Both the westslope cutthroat and the Dolly Varden migrate into small tributary streams to spawn. Cutthroat move into the tributaries during April and spawning will occur into July during the high flow period. Little, if any, spawning by this species occurs in the main rivers. The non-migratory (resident) cutthroat populations remain in the stream year-round, but spawning occurs at the same times as for migratory fish. These resident trout occur mostly in the upper reaches of the Middle and South Forks.

Dolly Varden or Bull Trout, the largest fish in the river system, are fall spawners and egg-laying may occur from September through mid-November. They have been tagged and migrations of over 100 miles have been observed. Cold headwater streams with clean gravel or rubble bottoms are preferred spawning area. After spawning the adults move downstream to Flathead Lake and Hungry Horse Reservoir. The Montana Department of Fish, Wildlife and Parks considered the Dolly Varden fishery of such high importance that a special regulation was put in effect which closed specific tributary streams to all angling (Mont. Dept. of Fish & Game, 1953). The closed tributaries of the Middle Fork are Granite, Morrison, Lodgepole, and Long Creeks and their tributaries. These closures were put in effect to provide spawning areas which would not be disturbed.

In addition to the resident fishery supported by most major streams and rivers of this area, the smaller drainages above them provides rearing and spawning habitat. All the streams, including those that are intermittent, influence the quality of the water in the major drainages.

Other Wildlife Species

A wide variety of other mammals, birds, and other wildlife species occupy the area under consideration. A few of these species include the wolverine, river otter, lynx, hoary marmot, goshawk, Cooper's hawk, Golden eagle, osprey, prairie falcon, merlin, Pileated woodpecker, olive sided flycatcher, western bluebird, and mountain bluebird (Holland, 1980).

For these species the only sensitive time period identified is as follows:

Raptor Nesting Period	3/1 to 7/15

C. Social and Economic Environment

The Affected Area

Although the three wildernesses and adjacent National Forest lands proposed to be explored by CGG are uninhabited, three out of eight Montanans live within a 90 minute drive of the area. Human populations would be affected by this activity in various ways, depending on such factors as their awareness of the areas resource potentials, the distance from the exploration activities, personal forest use patterns, and individual and group perceptions of appropriate wilderness uses.

On this basis, three concentric zones of influence may be defined: the local, the regional, and the National. As one moves outward through these zones, the types and frequency of effects tend to diminish, because of fewer social, economic, cultural, and personal ties between the zone population and the affected area.

1. The nine-county local zone. About 300,000 people reside in the nine counties that include or are adjacent to the area proposed for exploration (Table 1).

TABLE 1 - ZONE OF GREATEST SOCIAL AND ECONOMIC INFLUENCE

County	Official Population in: 1950	1960	1970	Estimated for: 1980	1990	% Increase 1970-76-77	
Cascade	53,027	73,418	81,804	85,600	93,000	3.2	3.2
Flathead	31,495	32,965	39,460	48,900	55,600	15.8	17.5
Glacier	9,645	11,565	10,783	11,200	11,600	2.7	1.3
Lake	13,835	13,104	14,445	18,000	18,900	20.5	21.5
Lewis & Clark	24,540	28,006	33,281	40,900	48,800	14.5	18.1
Missoula	35,493	44,663	58,263	69,500	78,300	12.6	14.7
Pondera	6,392	7,653	6,611	7,100	6,800	5.4	12.2
Powell	6,301	7,002	6,660	8,000	8,300	14.2	11.8
Teton	7,232	7,295	6,116	6,300	6.200	3.4	6.5
Total	187,960	225,671	257,423	295,500	327,500	10.0	
Montana	590,966	674,720	694,409	785,500	860,400	8.8	9.6

Sources: U. S. Censuses, 1950, 1960, 1970
Montana Population Estimates, April 1979
Montana Population Projection, July 1978

Most live within 75 miles of a wilderness entry point, making daily or weekend wilderness use feasible. Many have developed customary use patterns such as hunting, fishing, hiking, camping, or berry picking.

Government employment exceeds the State average in this inner zone, accounting for a third of all jobs in Cascade, Lewis and Clark, and Powell Counties. Most of this employment is with Federal and State natural and human resource agencies, the Department of Defense, and local governments.

West of the Continental Divide, the wood products industries and tourism are the leading private sector activities. East of the Divide, grain farming and stock raising dominate. Most wilderness-related employment occurs in this zone. This includes outfitters and guides, commercial motels and campgrounds, restaurants and taverns, retail outlets for visitors, and flying services. In all counties except Glacier, recorded mining activity accounts for less than one percent of employment. Four large market centers, Missoula, Kalispell, Great Falls, and Helena, are located in the outer edge of this zone.

Especially in the last decade, additional people have migrated to western Montana to escape urban blight and to enjoy the areas remarkable scenery and opportunities for outdoor recreation. Significantly, the population in these counties has increased about two percent annually during this period, despite the absence of large-scale industrial development in most locations and higher than average levels of local unemployment.

The counties and cities of the inner zone, along with the Federal government, are the political jurisdictions responsible for wilderness activities, including protection of plants and wildlife, pollution control, law enforcement, and the provision of facilities and services for visitors. Their populations have the strongest ties to the wilderness, and in many respects, have the most to lose if wilderness values are compromised.

2. The regional zone. A million people live in the northern Rockies region, comprising western and central Montana, northern Idaho, and northeastern Washington (including Spokane). Most of the people of this region are aware of the potential of the Bob Marshall and neighboring wildernesses, and close enough (within 300 miles) for repeated seasonal uses such as hunting, camping, cross-country skiing, or nature study. This regional dimension is also evident in the policies and management concerns of the State of Montana and the Northern Region of the Forest Service.

3. The National zone. A National zone exists because there is nationwide interest in what happens in National Parks and wildernesses. Several categories of the public can be identified. Many persons and organizations strongly support a concept of

wilderness which is incompatible with most types of minerals activities, especially those involving motor vehicles, nonmanual equipment, and the contruction of roads or other facilities.

Other people possess a special interest in particular wilderness attributes. Common examples include:

- a scientific interest in the flora or fauna, including endangered species,
- an industry interest in existing timber or mineral resources,
- an urbanite's quest for extended solitude,
- an investor's interest in profit on his energy corporation stocks,
- a consumer's desire for dependable gasoline and fuel oil supplies, whatever their source,
- an ecologist's wish to preserve some relatively undisturbed ecosystems within the United States.

Recreation Use

The Bob Marshall and Great Bear Wildernesses receive approximately 190,000 visitor days of use annually. The majority of use occurs in the summer and fall. There are few winter visits. The summer use period begins in late-June, peaks in mid-August, and ends after Labor Day. The fall use period peaks in mid-September and then declines steadily until the end of the big game season in late-November (Table 2).

TABLE 2 - RECREATION USE SUMMARY (RVD)*

Bob Marshall and Great Bear Wildernesses

Activity	Spotted Bear RD	Hungry Horse RD	Rocky Mtn RD	Total
Camping	13.5	5.5	13.3	32.3
Unique & Unusual Environment	17.5	0.3	6.0	23.6
Nature Study	0.5	0.1	1.8	2.4
Mtn. Climbing & Scenery	0.1	0.1	3.0	3.2
General Knowledge	0.8	---	0.6	1.4
Fishing	23.0	4.0	6.9	33.9
Hiking	17.0	3.6	11.1	31.7
Horseback Riding	17.1	---	6.6	23.7
Bird Hunting	0.2	---	0.3	0.5
Big Game Hunting	16.4	3.9	5.1	25.4
Watercraft	1.5	0.8	---	2.3
Other	1.3	---	---	1.3
				190.7

Note: All values expressed in thousands.

*Recreation Visitor Day - The use of an area for a total of 12 person-hours by one or more people, either continuously or spread over several visits.

Source RIM, 1979

Wilderness Expectations

Visitors arrive in the wilderness with pre-conceived perceptions and expectations. These perceptions and expectations may or may not be within the scope of the Wilderness Act. The fact remains that they exist and that they are important to the visitor. In wilderness, the visitors expect to find solitude, a natural environment, primitive and unconfined recreation opportunities, and a lack of the trappings of civilization. These values are the cornerstone of the definition of wilderness in the Wilderness Act.

Because of the emphasis placed on these values in the Act, much of the public perceives that wilderness cannot exist without these values. For this reason, much of the public does not accept or recognize exceptions written into the Act. To these visitors, anything that infringes on solitude or that introduces the trappings of civilization on a large scale destroys the value of the wilderness and the wilderness experience, even though they may be allowed by the Act.

Summer Use

Summer visitors pursue a variety of activities, including hiking, backpacking, horseback riding, fishing, floating, photography, and viewing scenery. Private parties comprise 55-65 percent of the visitors; the rest are accompanied by commercial outfitters. Use is divided between horse and backpack groups. Commercial use is almost entirely by horse parties. The heaviest use is concentrated along major travel routes, major rivers and streams, and mountain lakes. Generally, use along trails, rivers, and streams is transient in nature, while use at lakes is destination-oriented. The exception is the South Fork of the Flathead, which draws large numbers of destination-oriented parties. The Middle Fork and South Fork of the Flathead River are part of the Wild and Scenic River System. Both are popular with floaters. The float season on the Middle Fork is from late-May to mid-July, with the primary launch point at Schafer Meadows. On the South Fork, it is from the first of July through the end of August, with primary launch points at Black Bear, Salmon Forks, Big Prairie, and the headwaters.

In addition to major access trails, there are several areas within the wildernesses which receive unusually high use. They are: the South Fork River corridor, Big Salmon Lake, the Chinese Wall, the Middle Fork River corridor, Schafer Meadows, Sunburst Lake, the North and South Forks of the Sun River.

Fall Use

In the fall major use is hunting, which is virtually all stock-supported. Private parties make up 40-50 percent of the visitors. Use is at its peak at the start of the big game season in mid-September. After the first week in October, private party use declines rapidly. Commercial outfitter activity remains fairly constant throughout the fall. Many hunter camp sites coincide with popular summer use areas; however, in general, the campsites tend to be more scattered from the popular travel ways. Hunter trips are almost entirely destination-oriented. Hunting areas radiate out from campsites from one to three miles. With the exception of the Sun River Game Preserve, hunting activities cover the entire area. The heaviest concentration of use occurs in the easily accessible fringe areas.

Day Use

There is some day use around the fringes of the wildernesses. Most of it occurs in the northwest corner of the Great Bear Wilderness, adjacent to U.S. Highway 2 and near access points on the east side of the area. Another popular area is Schafer Meadows, which is accessible by plane. Week-ends are the most popular times for day use.

Commercial Use

Commercial outfitters serve a significant part of the visiting public during the summer and fall. There are over 50 outfitters operating in the area. Summer trips are primarily transient in nature, although there is some use of fixed base camps. To a large degree, commercial parties use the same areas as private parties. Some outfitters, however, prefer to schedule portions of their trips to more lightly-used and remote areas. Routes on summer trips may vary widely from year to year. Outfitter hunting trips are conducted out of reserved base camps scattered throughout the area. The period of use for each camp varies with the individual outfitters. Some camps are in place and in use from early-summer through November. Outfitters also provide drop-camp services for private parties.

Aircraft Use

There are four airstrips which are open to public use: Spotted Bear, Meadow Creek, Benchmark, and Schafer Meadows. The first three are outside of designated wilderness and receive moderate recreation use. The Schafer Meadows Airstrip is within the Great Bear Wilderness. Each year, 400 to 500 landings occur. On popular week-ends, there may be as many as 10 to 20 landings per day.

Sensitive Recreation Areas

The wildernesses contain many areas that receive heavy visitor use, either because of their locations or their scenic and recreation attraction. These areas can be divided into the following categories (Flint, 1980):

1. Critical Access Trails
2. Secondary Access Trails
3. Critical Heavy Use Area
4. Other Heavy Use Areas
5. Commercial Outfitter Base Camps

The critical access trails and critical heavy use areas are those that are essential to public use of the two wildernesses. The entire area covered by this proposal is considered to be in the critical heavy use area category during the period beginning ten days before the big game season and ending the last day of November.

The most important critical heavy use areas are described below. The heavy use period is from June 1 to November 30.

1. Schafer Meadows
Schafer Meadows is the recreational hub of the Great Bear Wilderness. This area offers a opportunity to fly into the middle of the wilderness. Many visitors take advantage of this opportunity for fishing, hiking, and camping. One commercial outfitter adjacent to the airstrip provides service for fly-in users.

2. South Fork Flathead River Corridor and Big Salmon Lake
This is the most heavily-used area in the two wildernesses. Its scenic beauty and opportunities for fishing and floating attract a very high percentage of the total wilderness visitors. It is a major travel corridor which most visitors must use to reach other portions of the Bob Marshall Wilderness.

3. Chinese Wall
This unique geological formation is the major attraction and is a nationally-reconized symbol of the Bob Marshall Wilderness.

4. Sunburst Lake
This alpine lake is located at the foot of Swan Peak in a relatively isolated pocket of wilderness. Perennial snowfields lie above the lake. Its scenic beauty and fishing draw many visitors each year.

5. North and South Forks of Sun River
These areas are relatively close to the edge of the Bob Marshall Wilderness. Visitors are attracted by the easy access and fishing. The areas are also major travel routes to other portions of the wilderness.

6. Middle Fork Flathead River Corridor
Middle Fork River corridor receive heavy use early in the season because of its white water floating. Later in the season, hikers, horsemen, fisherman, and hunters use the area.

Secondary access trails, commercial outfitter base camps, and other heavy use areas may need special consideration. The critical period for all these areas is July 1 to November 30.

3. EVALUATION CRITERIA

A. Formulation of Evaluation Criteria

In order to evaluate the alternatives identified in this environmental analysis, nine evaluation criteria were formulated from the identified issues and concerns. Evaluation criteria are used to measure the differences between alternatives and to establish a qualitative measure of each alternative's relative satisfaction of the issues and concerns.

B. Evaluation Criteria

The evaluation criteria and their relationship to issues and concerns are shown below:

Issues and Concerns	Evaluation Criteria
1. Will this proposal lead into furthur exploration and development?	No evaluation criteria developed; this issue is discussed in Section 4 & 5 - Alternatives Considered and Effects of Implementation.
2. Does the proposed seismic exploration: *Meet existing statutes and FS Policy? *Conform with the public's perception of wilderness uses?	1. Does the alternative comply with the Wilderness Act? 2. Does the alternative comply with Forest Service Policy? No evaluation criteria developed; This issue is discussed in Section 2 - Wilderness Expectations.
3. Does the proposed seismic exploration provide for an orderly and timely evaluation of the Nation's potential energy resources?	3. Does the alternative provide for the collection of data of sufficient quality to permit an orderly and timely evaluation of the Nation's potential energy resources?
4. What effects would the proposed seismic exploration have: *Upon threatened or endangered species and upon big game and fish? *Upon the area's vegetation and the soil-air-water system?	4. Does the alternative comply with the Endangered Species Act of 1973 as ammended? 5. Would implementation of this alternative have an unacceptable adverse effect on big game or fish? 6. Would implementation of this alternative have unacceptable adverse effects on the area's soil-air-water system?

Issues and Concerns	Evaluation Criteria
5. What effects would occur if mechanized equipment were not used?	No evaluation criteria developed; This issue is the basis for Alternative #4. It is evaluated through analysis of all alternatives.
6. What effect would the noise from explosives and helicopters have on: *Recreational use of the wilderness? *Safety of the wilderness user?	7. Would implementation of this alternative have unacceptable adverse effects upon the wilderness user?
7. What potential fire hazards are involved with the proposed type of seismic exploration?	8. Would implementation of the alternative create an unacceptalbe fire hazard?
8. Is the proposed action within the Forest Service's capability to implement and administer?	9. Is the alternative within the Forest Service's capability to implement and administer?

4. ALTERNATIVES CONSIDERED

A. Formulation of Alternatives

The seismic lines as proposed by CGG were relocated to avoid or minimize conflicts with surface resources or uses, such as sensitive wildlife areas, critical heavy use recreational areas, and other recreational areas. These changes were reviewed by CGG. These relocated seismic lines would be used for exploration activities identified in all "action" alternatives. The alternatives were based upon the requirements of NEPA, existing statutes and policy, and the issues and concerns.

The Federal Governments Participation in the Collection of Seismic Data

Several individuals expressed the opinion that, if seismic exploration were to be permitted in the wildernesses, it should be done by the federal government or at least a public agency should have access to the data gathered. This opportunity has been analysed and the findings are outlined below.

The federal government may request the opportunity to review the proprietary data gathered by a seismic exploration. However, if the federal government wishes to process and interpret the seismic data it must purchase it.

The U.S. Geological Survey is the only federal agency with the technical expertise and facilities to analyse seismic data. But they do not have the equipment, manpower or funds to conduct seismic field investigations.

In the past, the Geological Survey has contracted for the purchased seismic data from exploration firms. In those cases in which the Survey has acquired sole rights to the data they can publish all data characterizations. However, if the data is shared with industry, provisions must be made to protect proprietary rights.

The Geological Survey has previously stated subsurface geologic data is necessary to futher refine knowledge of the geologic evolution and hydrocarbon potential of the area (Mudge and others, 1979). For this reason the Survey has expressed a willingness to purchase all or part of one of the five seismic lines proposed by CGG (Mast, U.S.G.S. Oil & Gas Branch, personal communication, 1980). However, because the Geological Survey is required to publish the results of its research, an agreement would have to be written with CGG which would specify at a minimum the amount and kinds of data to be published. Without this type of agreement this opportunity is not viable.

If the Geological Survey were to acquire seismic data along a single line, the analysis of this data would permit subsurface geologic interpretations along the line, allow refined geologic interpretations of regional geology, and assure the quality of the data collected and the reliability of the interpretations made from it.

The Forest Service also has the option of purchasing any seismic data. However, at this time the Forest Service has neither the equipment and expertise needed to analyse the data nor the funds necessary to purchase the data. If the Forest Service were to acquire the data the U.S. Geological Survey has agreed that it would assist the Forest Service with data analysis. Thus, given the necessary funding this option for data review and analysis would be viable. Data purchased by either the U. S. Geological Survey or the Forest Service is an opportunity which could be made part of any "action" alternative .

B. Description of Alternatives

The ID Team studied the possibility of delaying the decision on this prospecting permit request in the wildernesses until such time as oil and gas exploration has been completed on adjacent non-wildernesses lands. This possible alternative is based in the concept that a thorough investigation of the adjacent nonwilderness lands would establish the hydrocarbon potential of the area and help to determine areas within the wildernesses with highest hydrocarbon potential. This course of action would delay exploration within the wildernesses until it was clearly established that potential energy resources from these lands was a national necessity.

There are limitations to implementating an alternative that includes this idea. First, the Wilderness Act of 1964 (78 Stat. 890) states that "Until midnight December 31, 1983, the United States mining laws and all laws pertaining to mineral leasing shall, to the same extent as applicable prior to the effective date of this Act, extend to those National Forest lands designated by this act as 'wilderness areas'..."

The Forest Service cannot disapprove oil and gas exploration on the basis of wilderness designation alone (c.f. Nelson, USFS Wash. Office 2820 Memo dated March 19, 1979). If the Forest Service were to delay action on applications solely on the basis of wilderness designation, they would be instituting a kind of administrative withdrawal contrary to the requirements for mineral withdrawal as stated in Sec. 204 of the Federal Land Policy and Management Act (43 U.S.C. 1701, Supp. 1977).

A prospecting permit granted by the Forest Service is based on the Secretary of Agriculture's authority to manage surface resources and to minimize conflicts with other uses and damage to surface resources (FSM 2821.01). A prospecting permit does not grant preference rights for later issuing oil and gas leases, nor does it have any effect on recommending issuance oil and gas leases to the Secretary of Interior, Bureau of Land Management under whose authority the Mineral Leasing Act of 1920 is administered (30 U.S.C. 181).

The request for a prospecting permit for these National Forest lands is within the rights of the applicant and the Forest Service must evaluate the request in compliance with NEPA and formulate a decision based on the effects of that action, or reasonable alternatives to that action.

Alternative 1 - No Action (Do not issue permit, continue present management).

If the environmental analysis conducted by the Forest Service finds that unacceptable adverse effects would arise from implementation of the proposed action or that the effects are not justified by the potential value of the mineral resource, then the Forest Service may choose to deny the requested permit.

Under this alternative management of the wilderness and other surface resources of the area would continue unchanged from the current situation. Analysis of the current management situation is being completed through the preparation of Forest Plans on both the Lewis & Clark and Flathead National Forests. The Environmental Impact Statement written for the Lewis & Clark plan will establish management direction for surface resources and uses of the wildernesses including recommendations for oil and gas lease issuance or denial. The Flathead National Forest will prepare a separate EA to formulate its recommendations.

Alternative 2 - Permit surface-charge seismic exploration using helicopters in both wilderness and nonwilderness areas during the summer season as proposed by CGG.

The proposed seismic exploration method, called a "Modified Poulter Method," has been widely used in recent years throughout the more inaccessible, rugged mountainous terrain of Western North America including National Forest lands in Utah, Wyoming, and Montanta. This method consists of detonating a series of 50 lb. "shots" of explosives at "shotpoints" located at 330 foot intervals along the seismic line. Each shot consists of 10 individual 5 lb. "charges" of explosive, each affixed to a wooden lath so that the explosive is suspended about 30 inches above the ground. For each "shotpoint" the "charges" are distributed evenly over a 165 foot interval of the seismic line, primacord is suspended between them and attached to an electric blasting cap and shooting wire. "Shotpoints" are normally located at 330 foot intervals along the line. No "live" shots are left unattended and at least four people are positioned around each shot to insure the safety of the Forest user or Forest animal.

Implementation of this method requires 29 people: 4 surveyors, 3 for checking for fires, and 22 for layout, shooting, and pick-up. The crew is responsible for laying out the seismic cable and geophones; setting up and detonating the shot; recording the seismic data; picking up all cable, flagging, and debris; and monitoring for safety and fire hazard.

Two helicopters provide daily transportion of the crew from nonwilderness campsites to and from the seismic line and to transport equipment and supplies along the seismic line. One helicopter must be capable of moving the recording module that has a gross weigh of 1100 lbs. This recording module is moved forward in "leap-frog" fashion along the seismic line every 1 to 3 days.

Once the recording module is lowered to the ground in a natural clearing (6' diameter minimum) along the seismic line the seismic cables are attached. Under favorable conditions seismic exploration can be conducted for a distance of up to 5 miles on either side of the recording module before the module must be moved.

CGG reports that helicopter-portable, surface-charge seismic exploration method moves forward at an average rate of about 2 miles/day in similar mountainous terrain. This average rate includes time lost to bad weather, high wind, and interruptions due to periods of high fire danger.

A comparison of Alternative 2 with other "action" alternatives considered in this analysis is shown in Table 3. The resource management measures which would be required if this alternative were to be implemented are listed in Table 4.

Alternative 3 - Permit surface-charge seismic exploration using helicopters in nonwilderness areas only.

This alternative would permit seismic exploration as discussed in Alternative 2 only on those segments of seismic lines which are located outside of the wildernesses.

A comparison of Alternative 3 with the other "action" alternatives considered in this analysis is shown in Table 3. The resource management measures which would be required if this alternative were to be implemented are listed in Table 4.

Alternative 4 - Permit surface-charge seismic exploration using nonmechanized transportation, except for moving the recording module in wilderness, and helicopters in nonwilderness areas.

This alternative would permit seismic exploration as discussed in Alternative 2 throughout the area but would require the use of pack animals for transporting men and supplies within wilderness. The use of a helicopter for transporting the seismic recording module would be required as described in Alternative 2.

Implementation of this method with pack animal transportation would require a 29 person seismic field crew and 6 to 8 people to manage the stock. The use of pack animal transportation would also require that a series of wilderness campsites would have to be established along each seismic line. When this method was used previously by CGG, a total of 60 horses were used: 30 horses to pack supplies from trailheads to base camps, and 30 horses to move equipment and supplies back and forth along the seismic line.

CGG reports previous experience with the use of pack animal transportation progressed at the rate of 0.5 miles/day or approximately 25 per cent of the helicopter transportation rate. The use of pack stock transportation also requires that base camps be within at least 2 hours travel time from the segment of the seismic line being worked.

A comparison of Alternative 4 with the other "action" alternatives considered in this analysis is shown in Table 3. The resource management measures which would be required if this alternative were to be implemented are listed in Table 4.

Alternative 5 - Permit seismic exploration utilizing other methods:
a. Shallow shot-hole seismic exploration using small, helicopter-portable drills (portadrill method).
b. Surface-charge seismic exploration conducted during the winter and using snow machine transportation (over-the-snow method).

This alternative is discussed in two parts, each outlining the requirements and characteristics of the alternative seismic exploration method.

5a. Portadrill Method

This alternative would permit the use of small, helicopter-portable drills capable of drilling a 3 to 4 inch diameter hole (called a shothole) to a depth of 10 to 20 feet. Each drill is driven by a gasoline engine and fitted with an air compressor which is used to blow the drill cuttings (rock chips and dust) out of the hole.

The shotholes are loaded with a 3 to 5 lb. charge of dynamite fitted with an electric cap. The hole is backfilled to the surface with drill-cuttings and gravel if necessary. Shot holes would be drilled every 330 feet along the seismic line.

Ten portadrills, each with a 3 person crew, would be needed. Two helicopters would move the portadrills along the seismic line; each portadrill being moved ahead in leap-frog fashion from the most recently completed hole to a new shothole at the front of the seismic line. Each helicopter would pass a given point along the line at least 5 times. Helicopters would also transport the 30 person drilling crew to and from nonwilderness base camps.

The portadrill method would require about 200-250 days for drilling and loading shotholes. Upon completion of the shotholes a 25 person seismic crew using two helicopters would be used as discussed in Alternative 2, the subsurface charges detonated, and the seismic data recorded in the recording module. The seismic field crew would need 90 to 120 days to complete this work. A total of 290 to 370 days would be needed to complete the portadrill seismic exploration.

Detonation of dynamite in the shotholes rarely creates surface cratering and noise is barely audible.

5b. Over-the-Snow

This alternative would permit the seismic method described in Alternative 2 with the exceptions that the survey would be conducted in the winter (12/1 to 3/31), over-the-snow, and the explosive charges would be placed directly on the snow. One helicopter for transporting the recording module and crew would be used.

The over-the-snow method would require a 29 person seismic field crew. The crew, equipment, and supplies would be transported by 7 snowmobiles. wilderness camping requirements would be similar to those outlined for Alternative 4.

Over-the-snow seismic exploration usually yields data of the same quality as the surface-charge method if it is done when snow depths are no greater than 36 inches. In greater snow depths recording difficulties and problems with effective geophone placement may reduce the quality of the seismic data.

CGG reports that the over-the-snow seismic exploration moves forward at a rate of 0.5 to 1.0 mile per day under favorable conditions. However, poor weather, deep snow, and avalanche hazards can result in much slower progress.

A comparison of Alternatives 5a and 5b with the other "action" alternatives considered in this analysis is shown in Table 3. The resource management measures which would be required if this alternative were to be implemented are listed in Table 4.

Alternative 6 - Permit surface-charge seismic exploration using helicopters in nonwilderness areas during the summer and in wildernesses only during the winter and spring.

This alternative is a combination of Alternatives 3 and 5b. Under this alternative seismic exploration would be conducted in nonwilderness areas as described in Alternative 3. In wildernesses, however, seismic exploration would be permitted only during the period from December 1 to June 20.

The exploration method employed in the wildernesses would consist of a "Modified Poulter Method" conducted by a 29 person crew transported and supplied by 2 helicopters. Where snow cover permitted, the explosive charges would be placed directly on the snow. The timing of exploration activities along various portions of the seismic lines would be strictly regulated to avoid wildlife and wilderness user conflicts. Camping within the wilderness would not be required.

A comparison of Alternative 6 with the other "action" alternatives considered in this analysis is shown in Table 3. The resource management measures which would be required if this alternative were to be implemented are listed in Table 4.

TABLE 3 - COMPARISON OF "ACTION" ALTERNATIVES

Alt	Seismic Crew Size	Support Crew Size	Transportation & equipment	Average Miles/ Day	No. of Days to Complete
2	29	0	2 helicopters 1 recorder	2	120
3	29	0	2 helicopters 1 recorder	2	23
4	29	6 to 8	60 horses 1 helicopter 1 recorder	0.5	400 to 450
5a	25	30	2 helicopters 10 portadrills 1 recorder	1 (drilling) 2 (shooting)	290 to 370
5b	29	2 to 5	1 helicopter 1 recorder 2 snowmobiles 5 snowcats	0.5	200 to 400
6	29	0	2 helicopters 1 recorder	1	180 to 300

TABLE 4 - RESOURCE MANAGEMENT REQUIREMENTS OF "ACTION" ALTERNATIVES

X = required
- = not applicable

Management Measure Required	Alternative 2	3	4	5a	5b	6
1. Require compliance with all state and federal fire laws.	X	X	X	X	-	X
2. Require that the permittee maintain a fire cache at locations designated by the Forest Service during the fire season (5/1 to 9/30)(contents of fire cache to be specified in permit).	X	X	X	X	-	X
3. Prohibit open fires during the fire season except at approved campsites.	X	X	X	X	-	X
4. Require that all gasoline engines be equipped with Forest Service approved spark arresters during the fire season.	X	X	X	X	-	X
5. Require that a representative of the permittee communicate daily with the Forest Service during periods of high fire danger to determine if operations have been suspended.	X	X	X	X	-	X
6. The Forest Service will suspend all or any part of the operation during periods of high fire danger.	X	X	X	X	-	X
7. Limit explosives to "no flash" primacord and fire-retardant explosives during the fire season.	X	X	X	-	-	X
8. Require that a fire crew with appropriate hand tools patrol the shot line after each blast during the fire season.	X	X	X	X	-	X
9. Require that a fire crew with appropriate hand tools patrol the shot line after the completion of each day's activity during the fire season.	X	X	X	X	-	X
10. Require that all operations fires be suppressed and reported to the Forest Service immediately.	X	X	X	X	-	X
11. Require that a helicopter used on the project be equipped with water bucket during the fire season.	X	X	X	X	-	X
12. Require that one pilot and helicopter be certified for Forest Service use.	X	X	X	X	X	X
13. Require that the permittee post signs to inform the public when blasting is to occur within one mile of any trail. Signs shall be posted at the next trail junction back from the blast zone where Forest users can take an alternatite route.	X	X	X	X	X	X

TABLE 4 - RESOURCE MANAGEMENT REQUIREMENTS OF "ACTION" ALTERNATIVES

X = required
- = not applicable

Management Measure Required	Alternative 2	3	4	5a	5b	6
14. Require that the permittee post warning signs at least one mile each side of the blast zone where stock can stand safely for long periods of time.	X	X	X	X	X	X
15. Require that a warning device normally audible for 300 yards be sounded one minute before each blast.	X	X	X	X	X	X
16. Require that an observer be stationed on each end of a shot to stop Forest users.	X	X	X	X	X	X
17. Require that all shots be detonated the same day they are laid out.	X	X	X	-	X	X
18. Require that all unused explosives be returned to the powder cache at the end of each day.	X	X	-	-	X	X
19. Prohibit leaving any portable powder magazine unattended on National Forest land.	X	X	X	X	X	X
20. Require the operation to be stopped every hour to allow Forest users to pass safely through the area when blasting or drilling is to occur within 1/2 mile of any trail.	X	X	X	X	-	X
21. Require that helicopter flight routes be offset 1/4 mile where terrain permits from any trail unless the trail has been closed by special order.	X	X	X	X	-	-
22. Require that all cables or wires crossing a trail corridor (10 feet) to be buried within the corridor unless the trail has been closed by special order or is snow covered.	X	X	X	X	-	X
23. Prohibit storage of equipment or supplies within the trail corridor (10 feet) unless the trail has been closed by special order.	X	X	X	X	-	X
24. Prohibit any sling-loaded helicopter from flying directly over an occupied campsite.	X	X	X	X	X	X
25. Require that all cables or wires crossing the Middle and South Forks of the Flathead River be suspended a minimum of ten feet above the water.	X	-	X	X	-	X
26. Require that the permittee provide an operations schedule 60 days after signing the permit.	X	X	X	X	X	X

TABLE 4 - RESOURCE MANAGEMENT REQUIREMENTS OF "ACTION" ALTERNATIVES

X = required
- = not required

Management Measure Required	Alternative 2	3	4	5a	5b	6
27. Require that the permittee update the operating schedule two weeks prior to starting on any line segment. Line segments are to be identified on a map attached to the permit.	X	X	X	X	X	X
28. The Forest Service will issue a news release prior to the start of operations describing the nature of the work and the proposed schedule. Updates shall be issued every two weeks to inform the public of current work locations.	X	X	X	X	X	X
29. The Forest Service will post all major trailheads to insure public awareness of the operation, trail closures, detours, and alternate routes.	X	X	X	X	-	X
30. Limit the permit to one operating season.	X	X	-	-	-	-
31. Prohibit more than one exploration crew in the wilderness at a time.	X	-	X	X	-	-
32. Prohibit operations during the period ten days prior to the start of big game season through the end of big game season.	X	X	X	X	X	X
33. Require that helicopters follow flight routes paralleling seismic lines in a corridor generally no wider than 1/2 mile. Deviation from these routes will be approved in writing in advance by the appropriate District Ranger.	X	-	X	X	-	-
34. Prohibit using helicopter flight routes which parallel the Middle and/or South Forks of the Flathead River within five miles except when working on a line which is within five miles of either river.	X	-	X	X	-	-
35. Require that helicopter flight routes be less than 400 feet or more than 2,000 feet above the ground except when ascending or descending.	X	-	X	X	-	-
36. Where possible require that seismic lines paralleling trails be a minimum of 200 feet from the trail.	X	X	X	X	-	X
37. Operation in wildernesses to be between 12/1 to 6/20.	-	-	-	-	-	X

TABLE 4 - RESOURCE MANAGEMENT REQUIREMENTS OF "ACTION" ALTERNATIVES

X = required
- = not required

Management Measure Required	Alternative					
	2	3	4	5a	5b	6
*SPECIFIC SITE REQUIREMENTS (Location is shown on the map which will be made a part of the permit.)						
38.*Line 1 - Middle Fork Crossing Require work to be completed by 6/1.	X	X	X	X	-	-
39.*Line 1 - Middle Fork Crossing Require work to be completed prior to 3/15.	-	-	-	-	-	X
40.*Line 2 - Require that this line receive first priority for completion.	X	X	X	X	-	-
41.*Line 2 - Middle Fork Crossing Require work to be completed by 6/1.	X	X	X	X	-	-
42.*Line 2 - Middle Fork Crossing Require work to be completed prior to 3/15.	-	-	-	-	-	X
43.*Line 3 - South Fork Crossing Require work to be completed by 6/1.	X	X	X	X	-	-
44.*Line 3 - South Fork Crossing Require work to be completed prior to 3/15.	-	-	-	-	-	X
45.*Line 3 - Sun River Crossing Require work to be completed by 3/15.	X	X	X	X	-	-
46.*Line 3 - Headquarters Pass Prohibit blasting within 1/2 mile of Headquarters Pass.	X	X	X	X	X	X
47.*Line 4 - Benchmark Area Prohibit blasting 1/2 mile each side of the area and on weekends.	X	X	X	-	X	X
48.*Line 3 - South Fork Teton Road Prohibit blasting along the line segment extending to the end of the road during weekends.	X	X	X	X	X	X
49.*Line 5 - Middle Fork Crossing Require work to be completed by 6/1.	X	X	X	X	-	-
50.*Line 5 - Middle Fork Crossing Require work to be completed prior to 3/15.	-	-	-	-	-	X

TABLE 4 - RESOURCE MANAGEMENT REQUIREMENTS OF "ACTION" ALTERNATIVES

X = required
- = not required

Management Measure Required	Alternative 2	 3	 4	 5a	 5b	 6
51. The Forest Service will provide a permit administrator on the ground during each working day.	X	X	X	X	X	X
52. Prohibit blasting within any trail corridor (10 foot width).	X	X	X	X	X	X
53. Require that all crews camp outside of the wilderness.	X	X	-	X	-	-
54. Require that all campsites on National Forest lands be approved in advance in writing by the appropriate District Ranger, subject to such restriction as he may require.	X	X	X	X	X	X
55. Require that all refuse created by this operation be removed from the wilderness daily; prohibit on-site disposal.	X	-	X	X	X	-
56. Require that all refuse created by this operation be removed from the wilderness weekly; prohibit on-site disposal.	-	-	X	-	-	X
57. Require that all refuse created by this operation and concentrated on non-wilderness lands be removed from National Forest lands weekly. Burnable refuse may be burned on-site if approval is granted in advance in writing by the appropriate District Ranger.	X	X	X	X	X	X
58. Require that shot holes be located to prevent cratering.	-	-	-	X	-	-
59. Require that any craters which might result from blasting be rehabilitated to standards specified by the Forest Officer in charge.	-	-	-	X	-	-
60. Cutting of live vegetation is prohibited.	X	X	X	-	X	X
61. Cutting of live vegetation as authorized by a Forest Officer.	-	-	-	X	-	-
62. Require that helicopters land only at helispots approved by the Forest Officer in charge.	X	X	X	X	X	X
63. Allow helicopter use only to transport the recording module and for fire and rescue work.	-	-	X	-	-	-

TABLE 4 - RESOURCE MANAGEMENT REQUIREMENTS OF "ACTION" ALTERNATIVES

X = required
- = not required

Management Measure Required	Alternative					
	2	3	4	5a	5b	6
64. Prohibit tying pack or saddle stock to live trees.	-	-	X	-	-	-
65. Prohibit grazing except in areas approved in advance in writing by the appropriate District Ranger.	-	-	X	-	-	-
66. Require that all stock handling facilities be approved in advance in writing by the appropriate District Ranger.	-	-	X	-	-	-
67. Require that all pack and riding stock by kept on system trails unless off-trail use is approved by a Forest Officer.	-	-	X	-	-	-
68. Require that seismic lines remain as located on the maps attached to the permit except for minor adjustments. A minor adjustment is one in which the line is moved less than 1/8 mile without additional trail or stream crossings and which does not further impact any critical access trail or use area.	X	X	X	X	X	X
**SENSITIVE WILDLIFE AREAS (Locations are shown on the map which will be made a part of the permit.)						
69.**Prohibit activity on occupied elk winter range 12/1 to 5/1.	-	-	-	-	X	-
70.**Prohibit activity on occupied elk calving areas 6/1 to 7/15.	X	X	X	X	-	X
71.**Prohibit activity on occupied bighorn sheep lambing areas 5/15 to 7/15.	X	X	X	X	-	X
72.**Prohibit activity on identified bighorn sheep rutting areas 10/15 to 12/31.	-	-	-	-	X	X
73.**Prohibit activity on occupied bighorn sheep winter range 11/1 to 5/1.	-	-	-	-	X	X
74.**Prohibit activities on occupied mountain goat winter range 11/1 to 5/1.	-	-	-	-	X	X
75.**Prohibit activities on occupied mountain goat kidding areas 5/15 to 6/15.	X	X	X	X	-	X

TABLE 4 - RESOURCE MANAGEMENT REQUIREMENTS OF "ACTION" ALTERNATIVES

X = required
- = not required

Management Measure Required	Alternative					
	2	3	4	5a	5b	6
76.**Prohibit activities on occupied moose winter range 11/1 to 5/1.	-	-	-	-	X	-
77.**Prohibit activities on occupied deer winter range 11/1 to 5/1.	-	-	-	-	X	-
78.**Prohibit activities along big game migration routes 3/1 to 6/1 and 11/1 to 1/1.	X	X	X	X	X	-
79.**Prohibit activities on occupied grizzly spring range from 3/15 to 7/1.	X	X	X	X	X	X
80.**Line 2 - Lewis & Clark NF boundary to Badger Pass Prohibit activities along big game migration route 9/30 to 4/30.	-	-	-	-	-	X
81.**Line 4 - Red Hill to Scapegoat Boundary Prohibit activities along big game migration route 10/1 to 11/31.	-	-	-	-	-	X
82.**Avoid helicopter use within one mile of identified big game summer concentration areas at dawn and dusk.	X	X	X	X	-	X
83. Prohibit helicopter use within 1/2 mile of osprey, eagle, or falcon nest nesting sites 4/1 to 7/30.	X	X	X	X	X	X
84. Require that bighorn sheep and mountain goats on or near cliffs be avoided or approached slowly to allow safe escape to cover.	X	X	X	X	X	X
85.**Prohibit activities on and 1 mile either side of identified grizzly denning from 11/15 to 5/10.	X	X	X	X	X	X
86. Require that seismic lines be relocated to preserve special wildlife habitats when they are encountered or identified prior to activity. Special habitats include, but are not limited to, elk wallows, mineral licks, waterholes, bedding sites, nests, and dens.	X	X	X	X	X	X
87. Prohibit drilling or blasting within 200 feet of creeks and 500 feet of rivers and lakes.	X	X	X	X	X	X

TABLE 4 - RESOURCE MANAGEMENT REQUIREMENTS OF "ACTION" ALTERNATIVES

X = required
- = not required

Management Measure Required	Alternative 2	3	4	5a	5b	6
88. Prohibit possession of firearms by seismic crews while on or over National Forest lands.	X	X	X	X	X	X
89. Prohibit wildlife harrassment from motorized vehicles.	X	X	X	X	X	X
90. The Forest Service reserves the right to review any seismic data as processed by the contractor.	X	X	X	X	X	X
91. The Forest Service reserves the right to purchase any seismic data which may be generated by the contractor.	X	X	X	X	X	X
92. No more than 10 miles of seismic line can be in operation at one time without approved clean-up of completed portions of the seismic lines.	X	X	X	X	X	X

Monitoring Requirements

The implementation of all "action" alternatives would require monitoring activities. Alternative 3 - nonwilderness seismic exploration would result in the least monitoring effort, consisting of daily supervision of seismic activity by a Forest Service permit administrator.

For all other "action" alternatives wildlife monitoring would focus on what effects the seismic exploration had on the wildlife population of the area. This monitoring would be accomplished by one week-long, before-during-after spot-checks along each seismic line by a wildlife biologist.

Recreation use level monitoring, as appropriate, would be carried out through the Forest's usual recreation-use inventory procedures. Forest Service District personnel including wilderness guards would be given special training and informational materials to help assure that the seismic exploration had the least possible effects upon the wilderness user.

Biophysical monitoring would be required on a daily basis (see Table 4, #51). Complete on-the-ground supervision by a permit administrator would insure compliance with all permit requirements and the avoidance of unidentified conflicts with surface resources and uses.

SECTION 5 - EFFECTS OF IMPLEMENTATION

A. Assumptions

1. Wilderness visitors are seeking solitude and relative freedom from the trappings of civilization.

2. Wilderness visitors do not expect to find substantial evidence of modern equipment and conveniences.

3. The visitor's perception of wilderness as a place free of noise and mechanized activity exists in spite of legal exceptions found in the Wilderness Act.

4. Noise from seismic activities will significantly reduce the wilderness experience available to Forest visitors.

5. Camping by the seismic crew inside wilderness will have a major physical impact on the site involved.

6. The number of stock needed to conduct the seismic exploration will cause the greatest impact to the physical environment and the least impact to the wilderness experience.

7. Use of mechanical equipment will cause the greatest impact to the wilderness experience and the least impact to the physical environment.

8. In wilderness, the shortest time to complete the project will disrupt visitors the least.

9. The potential risk of man-caused fires will be increased considerably, due to the proposed activities.

10. Proposed activities will create additional hazards for visitors to National Forest lands. These hazards will arise from blasting, noise, and increased traffic on roads and trails.

11. Actual blasting will pose a minor threat to human safety.

12. Noise from blasting and helicopters will pose an important threat to the safety of horse users.

13. Impacts from noise will be present throughout the life of the project, but will not have any lasting effect on the environment.

14. Impacts from the proposal will shift wilderness use patterns to some extent.

15. Impacts from the proposal may reduce wilderness use.

16. The appropriate Resource Management Requirements listed in Table 4 will be incorporated into any permit.

17. A number of wildlife species, especially big game and grizzly bears, will be temporarly displaced by the activity.

18. Helicopter use, blasting, and other activity will cause stress and additional energy expenditure to some wildlife species.

19. Injury or direct mortality to small birds, mammals, and other small wildlife may occur around explosive charges.

20. A very limited amount of direct mortality could occur to big game, especially bighorn sheep and mountain goats, around cliffs where falls could occur.

21. Direct mortality from blasting to other large wildlife will probably not occur because these species will move from the areas prior to blasting.

22. Some short-term impact on vegetative habitat will occur in the area; examples are vegetation destruction from blasting, trampling of vegetation by crews, forage consumption by horses.

23. Abandonment of nests or young could occur with some sensitive bird species such as prairie falcon, goshawk, and great gray owl.

24. Fish or their habitat will not be affected because blasting would not be permitted within 200 feet of creeks and 500 feet of rivers or lakes.

B. Environmental Effects

All "action" alternatives will have many similar effects on the environment. The differences relate primarily to magnitude of the impact and its duration. The magnitude and duration of impacts are discussed below as are the few effects that are unique to a particular alternative. The research of Deist (1980), Flint (1980), and Holland (1980) were particularly useful in analysing these effects.

Alternative 1 - No action (do not issue permit, continue present management)

This alternative creates no impacts on the environment. It does forgo the opportunity to further evaluate the gas and oil potential of the area covered by the application at this time. A comparison of this alternative with the effects associated with the "action" alternatives is given in Table 5.

Alternative 2 - Permit surface-charge seismic exploration using helicopters in both wilderness and nonwilderness areas during the summer season as proposed by CGG.

This alternative would provide for the collection of the most seismic data in the shortest period of time (except Alternative 3 which is restricted to nonwilderness areas). Data quality (resolution) should be high.

In general, any effect on soils or vegetation which might result from this seismic method would be restricted to about a 10 foot wide zone along the seismic line.

Erosion hazard may be increased by disturbing soil cover at the blast site. Blasting on steep side hills may effect slope stability. Air quality could be reduced in local areas due to dust created by blasting and helicopter operations. The risk of man caused fires would definitely increase. Surface blasting would introduce a new fire ignition source to the area. The risk of fires from smoking would increase due to the presence of crews in the area. Operations would run through the fire season, although they would be modified or suspended when the fire danger becomes high (midpoint Manning Class III; Deist, 1980). Some threatened and endangered species as well as other wildlife would be displaced from traditional ranges by noise created by blasting and helicopter use and by crew activities along seismic lines. It is expected that most displacement would be temporary (1-3 weeks). Some vegetation would be injured or destroyed at each blast site. Vegetation would be damaged by trampling at camp sites, outside the wilderness, which would accommodate the crew for long time periods.

Wilderness values would receive the greatest impacts. Activities would be concentrated during the heaviest recreational use period. Noise from blasting and continual helicopter use would eliminate solitude, a key wilderness value, in the active work zone and under flight routes. The presence of the seismic crew would further reduce opportunities for solitude. Disruptions associated with the project would cause some reduction in use levels and undoubtedly shift use patterns away from the disturbed areas. This may concentrate visitors on other sites. Areas under helicopter flight routes would be disrupted for the longest time. Since seismic lines and flight routes generally follow or parallel trails, there would be a substantial impact on use corridors.

Because of the steep ground and narrow trails, anything that frightens stock poses a threat to human safety. Noise from blasting and helicopters would be a major safety hazard to horsemen in spite of the efforts to control it. There would be some economic loss by recreation interests because of reduced use levels. Within a community, this should be offset by gains from sale of supplies and services to the seismic crew. Smaller communities may feel some increased demand for community services due to the presence of the seismic crew.

Economic Effects

CGG is a Colorado partnership registered with the Montana Secretary of State. Business conducted under any "action" alternative would be subject to the relevant tax laws of these states. Company and personal vehicles use on or in conjunction with any "action" alternative would be licenced in Montana. As issuance of a prospecting permit establishes no commitment to issue oil and gas leases, the economic effects of granting a prospecting permit are restricted to those effects associated with the seismic exploration.

CGG will be assessed an exploration permit fee. The fee is based on the number of miles of seismic lines, with the upper limit suggested as $160 per mile or $32,000 for the approximate 200 miles proposed (FSM 2821.21, December 1979). Twenty five percent of the fee collected would be returned to the State of Montana and in turn that money would be apportioned on an acreage basis to the counties of the affected forests.

The 29 person field crew, living in designated campsites, will make some local purchases in nearby communities and at least occasionally utilize other facilities during the 3 months they will be in the innermost impact zone. Helicopter fuel and gasoline for personal vehicles, quantities of foodstuffs, and the use of restauants, motels, churches, taverns, and medical facilities, are among the possibilities. Public knowledge of the presence of exploration activities could reduce recreation use, but the extent in uncertain.

Social Effects

Social effects are of three types, (1) at least temporary changes in wilderness use patterns, (2) adaptations relating to the presence of seismic crews in adjacent communities, and (3) public reaction to the decision to permit or exclude seismic exploration in the area. These are discussed below.

1. When the crew is in the field doing seismic survey work, for reasons of safety, other Forest users will have to be routed around their activities. The sound of two helicopters and periodic explosions will distract people from their wilderness experience. Since the crew moves about two miles daily, these effects will be brief in any particular locality.

2. To the extent that the crew utilize public campgrounds and other facilities, or the commercial services of rural areas, some problems may result from the fact that this is the high season for tourism, the time of the greatest demands for such facilities. Since the crew is small, transient, and generally without accompanying families, these effects are expected to be minimal. The needs of the crew may be offset by a reduction in tourism relating to increased prices or uncertain supplies of gasoline.

3. During this environmental analysis process, the Flathead and Lewis and Clark National Forests have been acquainting the public with the CGG exploration proposal. Analysis of responses reveals strong local opposition to oil and gas exploration in wildernesses (see Sec.9).

Although a carefully conducted random sample survey would be necessary to gain an accurate profile of public opinion on the subject, the public response data suggests a highly polarized public in the nine-county area, with a small minority favoring the proposed activity, a large majority unconditionally opposed, and another small minority approving if certain conditions are met.

Public responses from the regional and National zones were fewer, rather evenly divided between the two opposing perspectives, and included even fewer intermediate viewpoints.

A comparison summary of the effects associated with this alternative is given in Table 5.

Alternative 3 - Permit surface-charge seismic exploration using helicopters in nonwilderness areas only.

Action under this alternative would be by the same methods as Alternative 2. The biophysical effects would be the same except they would occur only on nonwilderness lands. Although data quality should be identical to that of Alternative 2, only 46 miles of line would be explored and the data gathered would be insufficient to permit a regional geological analysis.

Local, social, and economic effects would be minimal because the opportunity to explore in wildernesses would be denied, along with 78 percent of the proposed mileage of seismic lines for this project. Relatively little time would be required to complete remaining operations.

A comparison summary of the effects associated with this alternative is given in Table 5.

Alternative 4 - Permit surface-charge seismic exploration using nonmechanized transportation, except for moving the recording module in wilderness, and helicopters in nonwilderness areas.

Of all the alternatives which would allow operations in wilderness, Alternative 4 would create the greatest impact on the physical enviroment. Impacts outside the wilderness are the same as those described in Alternative 3. Data quantity and quality would be identical to that of Alternative 2.

Action under this alternative would be completed in 400-450 days or 3 to 4 field seasons by a crew of 35 to 37. It would have the longest completion time of any "action" alternative. Approximately 60 head of stock would be needed to transport men and equipment. Crews would have to camp in the wilderness. One helicopter would be required to move the recording module.

Within the wilderness virtually all the impacts found in Alternative 2 are present except that helicopter use and the resulting noise and dust has been greatly reduced. In addition, a 40 to 50 person camp would be established inside the wilderness. This is three times the maximum party size recommended in the Bob Marshall Wilderness Management Plan. To maintain reasonable travel times the camp would be moved every 8 - 10 days. Throughout the project a minimum of 40 camp sites would be used. Because of the location of the seismic lines the camps would be located, for the most part, in travel corridors. This would further reduce opportunities for solitude and increases the shift of use patterns. Because of the increased crew size and duration of the project the fire risk would increase.

The 60 head of stock used to support the project would create major impacts on the physical and biological resources of the wilderness. The Bob Marshall Wilderness Management Plan recommends a maximum of 35 head of stock per party. Stock used to move equipment within the wilderness would be based at or near the camps. Temporary stock handling facilities would be required. Vegetation would be trampled and soil compacted leaving scars that remain visible for years. Some grazing would be necessary since 100 percent feeding for long periods of time is highly impractical. This would cause an additional stress on an already limited forage resource. Grazing stock would compete with wildlife for available forage. Erosion may increase where stock is used in fragile apline areas. This may take years to heal.

Both social and economic effects would be similar to Alternative 2 except that:

a. Trails would receive greater use for exploration activities and thus, the level and patterns of wilderness recreation use would be modified for a longer period of time.

b. Hiring of the required 60 head of stock and 6 to 8 packers would more than offset any loss to recreation business.

c. Helicopter use and the resulting noise would be greatly reduced and less fuel would be purchased.

d. Demand for supplies would be greater because of the larger crew size and longer duration of the project.

e. The need for community services would be the least because the crew would be camping in the wilderness.

f. Public safety would be similar to Alternative 2 although there would be less helicopter use. The large number of pack stock would present additional hazards to the wilderness visitor.

A comparative summary of the effects associated with this Alternative is given in Table 5.

Alternative 5a - Permit seismic exploration utilizing the shallow shot-hole method using small, helicopter portable drills (Portadrill Method).

Action under this alternative would require the use of 10 gasoline engine driven portadrills. Two separate crews, a 30 man drill crew and a 25 man seismic crew, would be used. Two helicopters would transport each crew and their equipment. Work would be completed in approximately 290 to 370 days or 2 to 3 field seasons. Crews would camp outside the wilderness.

High quality seismic data should result if this alternative were implemented. The data gathered would be of sufficient quantity and quality to permit a regional geological analysis.

Air quality would be reduced in local areas by dust and exhaust emissions from portadrills and by dust from helicopters. This alternative would cause the greatest reduction in air quality for the longest period of time. Operation of portadrills on steep slopes may have a minor effect on slope stability. Risk of man caused fires from smoking and campfires would be higher than Alternative 2 since more people will be in the field. Gasoline engines on the portadrills would also increase the risk of fire. The risk of fires from blasting would be eliminated by the subsurface charges. Operations may run through the peak of fire season.

Wildlife would be displaced twice during this operation, once by drilling and a second time by blasting. The impact of helicopter use would also occur twice. In a single area, the duration of the disturbance from drilling alone would be longer than by surface charge exploration. This is the only action alternative in which live trees would be cut. In some cases a small (10 feet X 10 feet) clearing would have to be created to set up the portadrill. Some vegetation will be damaged on the drill sites.

Impacts on non-wilderness camps would be the same as those described for Alternative 2.

Although the noise from blasting would be reduced, it would be replaced by the noise of the portadrills. Helicopter use would be more in the drilling stage then it would be in the entire surface charge exploration. There will be additional helicopter use during the blasting stage. As in Alternative 2 solitude would be heavily impacted in the vicinity of drilling operations and along helicopter flight routes. Disruptions associated with this project would reduce use levels and shift use patterns away from the activity. This may result in a concentration of visitors on other sites. Impacts created by shifting use patterns would be magnified because of the separate drilling and blasting operations. As in Alternative 2, activities would occur during the peak visitor use period.

Subsurface blasting would reduce the safety hazard to horsemen. This would be somewhat offset by the noise from portadrills and increased helicopter use. The hazard would persist for a longer period of time because of the separate drilling and blasting operations.

Economic effects and impacts on community services would be similar to Alternative 2.

A comparative summary of the effects associated with this alternative is given in Table 5.

Alternative 5b - Permit surface-charge seismic exploration conducted during the winter and using snow machine and helicopter transportation (Over-the-Snow Method).

Action under this alternative would require use of one helicopter and where practical, several over-the-snow vehicles. A crew of approximately 30-35 would be used to complete the work. Crews would camp inside the wilderness when necessary. Work would be completed in 200-400 days or 2-4 field seasons.

The data collected when surface charges are detonated over or on the snow may be somewhat lower in quality than that collected from other surface-charge methods.

Effects on physical environment would be generally eliminated in this alternative. There would be a little reduction in air quality due to exhaust emissions from snow machines. There would also be some damage to campsites but it would be greatly reduced by the snow cover.

There would be some displacement of wildlife, but it would be greatly reduced since big game populations are concentrated and mitigating requirements prohibit operations in occupied winter range. Denning grizzly bear may be disturbed.

Impacts on wilderness solitude from noise and crew activities would continue to exist, but since the work would be done during the period of lowest use, few visitors would be impacted. Under this alternative use levels and patterns would be affected the least since few visitors are present.

Adverse effects on recreation income would be minimal. Impacts on community services and economic effects from services provided to the seismic crew would be the same as in Alternative 2.

Safety hazards to horsemen would no longer exist. There would be an increased hazard for seismic crews due to the winter operations.

A comparative summary of the effects associated with this alternative is given in Table 5.

Alternative 6 - Permit surface charge seismic exploration using helicopters in nonwilderness areas during the summer and in wilderness during the winter and spring. This alternative is a combination of Alternative 3 and 5b and was developed during the Evaluation of Alternatives (see page 59).

This alternative would be completed in two field seasons by a crew of 29 individuals. Two helicopters would be used. Data quality might be somewhat less than that for Alternative 2 but still of sufficient quality to permit regional geologic analysis

In the wilderness biophysical and socioeconomic effects would be very similar to those of Alternative 5b, except that there would be some additional effects during the spring. Winter wilderness use consists mainly of cross-country skiing in the vicinity of Essex, Holland Pass, and the Benchmark area and amounts to about 1% (1900 RVD) of the total use. In the spring the receeding snowpack usually leaves the main river trails useable by mid May. An additional 10% (19,000 RVD) of the total wilderness use occurs during the time period from about May 15 to June 20 and is generally restricted to the lower elevation areas.

Resource Management Requirements (Table 4) identified for this alternative would require that exploration activities on grizzly spring ranges be completed prior to March 15 to avoid any conflict with grizzly bear use of these areas. Thus, exploration activities would only be permitted on these low elevation grizzly spring ranges from December 1 to March 15 during which time these areas serve as big game wildlife winter ranges. As a result, within two winter seasons, some temporary displacement of big game wildlife would occur in these winter range areas (about 26 miles of seismic line).

Avoidance of grizzly bear denning habitat until after emergence would confine exploration activities to the period from May 10 to June 20 on an additional 55 to 60 miles of seismic line. Seismic activity in these areas generally over 6,000 feet in elevation, near ridge tops or treeline would also keep activity well removed from most, if not all of the spring recreation use areas.

Seismic exploration conducted in the wildernesses during the winter and spring would result in a potential crew safety hazard not associated with other summer season "action" alternatives, frequently poor and unpredictable weather, intense cold, and difficult working conditions during December through March may result in lost work time and the possibility that the crew may have to bivouac in the wilderness to wait out storms or fog. Improving weather conditions after March would reduce this winter survival safety hazard for the crew. Throughout the time period however, some localities would be subject to a snow avalanche hazard.

In nonwilderness areas effects would be the same as Alternative 3.

A comparative summary of the relative effects associated with this Alternative is given in Table 5.

TABLE 5 - A COMPARISON OF RELATIVE EFFECTS BY ALTERNATIVE

Alt	Physical			Biological					Wilderness			Other					
	Soil	Air	Fire	Threatened and Endangered Species	Wildlife	Timber	Forage	Other Vegetation	Solitude	Use Patterns	Use Levels	Recreation Business	Other Business	Community Services	Public Safety	Crew Safety	Data Gathered
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	3	4	4	2	4	0	0	3	4	4	3	3	2	4	5	0	5
3	2	2	2	1	2	0	0	2	0	0	0	2	1	2	3	0	2
4	5	3	5	3	3	0	5	5	3	4	4	4	5	1	4	0	5
5a	4	5	3	5	5	5	0	4	5	5	5	5	4	5	2	0	5
5b	1	1	1	4	1	0	0	4	2	1	1	1	3	3	1	5	4
6	3	2	1	3	3	0	0	3	1	2	2	1	2	4	3	4	4

0	1	2	3	4	5
Present Situation	Least Effect				Most Effect

C. Expected Outputs

Selection of Alternative 1 would result in no change in the current and projected amount and kind of nonmineral and mineral resource outputs from these National Forest lands.

Changes in outputs resulting from the selection of Alternatives 2, 3, 4, 5a, 5b, and 6 are expected to vary in type, amount and duration. A qualitative summary of changes in affected outputs is shown in Table 6. The changes reflect the expected interaction of the biophysical characteristics of the environment, the existing management situation, and the constraints and opportunities afforded by the alternatives. All changes in output are short-term in nature and are generally not expected to last beyond the time period required for completion of the exploration activity.

Wilderness and Dispersed Recreation Use

Dispersed recreation use in a nonwilderness setting is not expected to be noticeably affected by implementation of either Alternative 2, 3, 5b or 6. Potential conflict with the big game hunting season is specifically prohibited in all alternatives and thus, little effect on this dispersed recreation use is expected.

The brief duration of effects (1 field season) resulting from exploration activities described in Alternatives 2 and 3 coupled with the prohibition of weekend activity in high recreation-use areas would result in little, if any, change in nonwilderness, dispersed recreation use patterns or levels (Output codes W07, 09 FSH 1309.11).

Alternative 5b and 6, because exploration activity would only be permitted during the winter when use is very light, would result in little effect on wilderness and dispersed recreation use (Output codes W07, 09, 16, 18; FSH 1309.11).

Alternative 4 which relies principally on pack animals to move and supply the exploration activity would utilize the existing trail system and proceed at a rate of about 0.5 miles/day (3 to 4 field seasons). There is little flexibility in location and timing of exploration activity. Many conflicts with the wilderness or dispersed recreation user cannot be avoided or mitigated. It is expected that implementation of this alternative would result in a slight decrease in dispersed recreation use (W07, 09) and a greater decrease in wilderness uses (Output codes W16, 18; FSH 1309.11).

Implementation of Alternative 5a - Portadrill would require the use of more equipment and a larger crew during the spring, summer, and fall than any other "mechanized" alternative. Although little, if any, noise would result from detonation of the shothole explosives, the increased use (2 to 3 field seasons) would probably result in a greater reduction of wilderness and dispersed recreation use (Output codes W07, 09, 16, 18; FSH 1309.11) than Alternative 2, 3, 5b, and 6.

Wilderness use (Output codes W16, 18; FSH 1309.11) would be slightly reduced by the implementation of Alternative 2. The relative speed, mobility, and flexibility of this method enables the avoidance or mitigation of many wilderness use conflicts. While it is probable that some wilderness users would defer the use of the wilderness areas while any type of seismic exploration was occurring it is expected that the noise from blasting and helicopters would result in a slight decrease in overall wilderness use and, where possible, a temporary shift in wilderness use patterns to avoid interaction with the seismic exploration. Because Alternate 2 - Helicopter-portable, surface-charge progresses at the rate of about 2 miles/day and would have a duration of 1 field season the effects of the method on wilderness use outputs would be slight.

Grazing Capacity

The use of 60 pack or saddle stock as provided by Alternative 4 would result in a slight reduction of grazing capacity of some areas (Output codes W41; FSH 1309.11). Although grazing would be permitted only at approved areas some uncontrolled grazing would also inadvertently occur.

Prospecting Permits

Implementation of any "action" alternative would result in the output of 1 prospecting permit (Output codes W84; FSH 1309.11).

TABLE 6 - EXPECTED CHANGES IN OUTPUT BY ALTERNATIVE

Resource Output Affected (1)	2	3	4	5a	5b	6
1. Dispersed Recreation Use (W07-RVD) (2)	C	C	SD	SD	C	C
2. Dispersed Recreation Use - Fishing (W09-RVD)	C	C	SD	SD	C	C
3. Wilderness Use (WI6 - RVD)	SD	NA (4)	D	D	C	C
4. Wilderness Use - Fishing (W18 - RVD)	SD	NA	D	D	C	C
5. Grazing Capacity (W41 - AUM) (3)	NA	NA	SD	NA	NA	NA
6. Prospecting Permits (W84 - Permits)	SI	SI	SI	SI	SI	SI

Change in Outputs

D	SD	C	SI	I
Decrease	Slight Decrease	Remain About Constant	Slight Increase	Increase

(1) Expressed by Management Information Handbook output name and code number (FSH 1309.22).

(2) RVD - unit of measure, recreational visitor day.

(3) AUM - unit of measure, animal unit per month.

(4) NA - not applicable.

D. Estimated Forest Service Expenditures for Implementing Each Alternative

Alternative 1 would result in no direct expenditures beyond those already incurred from the environmental analysis. The Forest Service costs, which would be incurred from implementing Alternatives 2, 3, 4, 5a, 5b, and 6 is shown in Table 7. Variations in the duration and complexity of the action are the main source of variation in the implementation costs of these alternatives.

CGG has indicated that if a permit were granted they would agree to have at least one helicopter and pilot inspected and certified to permit Forest Service administrative use. This use of the contractor's helicopter at no charge to the Forest Service would consist of almost daily trips to and from the survey area by the project inspector. This use conforms with helicopter use and safety proceedures adopted by the Forest Service for the administration of helicopter-portable seismic investigations (Jim Scofield, personal communication USFS Northern Region).

TABLE 7 - ESTIMATED FOREST SERVICE EXPENDITURES FOR IMPLEMENTING EACH ALTERNATIVE

Required Forest Service Activity - Median Project Days	Estimated Alternative Cost ($)					
	2 120 day	3 23 day	4 425 day	5a 330 day	5b 300 day	6 240 day
1. Permit preparation & issuance	550	550	550	550	550	550
2. Permit administration(1)						
a. Inspector's salary	15,600	1822(3)	55,250	42,900	39,000	34,320
b. Wildlife monitoring	4,375	875	4,375	6,125	5,000	5,000
c. Travel (200 mi/wk @ .20/mi)	960	184	3,400	2,640	2,400	1,920
d. Meals/per diam ($12/day)	1,440	276	5,100	3,960	3,600	2,880
e. Helicopter use(2)	NC(5)	NC	NA(4)	NC	NC	NC
f. Use of horse ($15/day)	NA	NA	6,375	NA	NA	NA
g. Compliance checks (FMO - $120/inspection)	1,200	360	2,880	1,440	0	600
3. Indirect support						
a. Forest & District Information program including preparation, printing, and distribution of information & schedules	1,200	200	4,800	3,600	200	200
b. Inspector training - wilderness, seismic methods and helicopter safety (3 inspectors)	4,860	NA	3,888	4,860	4,860	4,860
c. CGG crew training in wilderness use and requirements (3 days)	1,000	NA	1,000	1,000	1,000	1,000
4. Estimated total FS cost including 20% general administrative costs	37,422	5,120	105,142	80,490	67,932	61,596
5. Optional FS purchase of data (about 200 mi at $2,000/mi)	$400,000	NA	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN
6. Permit fee collected from CGG (about 200 mi except #3 is 46 mi)	$160/mi $32,000	$160/mi $7,360	$160/mi $32,000	$20/hole $64,000	$160/mi $32,000	$160/mi $32,000

1. FY 80 (GS-9 salary + 10% + 4 hrs OT/day + 10% = $130/day X median project days X 10%)

2. CGG has agreed to supply administrative travel in a FS inspected helicopter with a "carded" pilot

3. FY80 (GS-9 salary + 10% X median project days + 10%)

4. NA = not applicable

5. NC = no charge

6. EVALUATION OF ALTERNATIVES

A. Process

This section displays the process used to select the preferred alternative. A systematic, evaluation method is used. The process, called K-T, breaks the decision analysis into a number of sequential steps. As one moves through the steps the impacts and effects can be evaluated. The process also enables the pre-testing of accuracy of the decision before taking action. (Problem Analysis and Decision Making, Kepner-Tregoe, Inc, 1973).

First, because the evaluation criteria (see Section 3) are not of equal importance, they are separated into two groups. The required criteria are those that are essential and must be met. The want criteria are those that are desirable. If an alternative does not meet the required criteria it is dropped from further consideration.

Next, the want criteria are ranked in order of importance. A relative weight is assigned to each want criterion. Then, each alternative is evaluated against the criteria and a value factor or score assigned. The outputs, effects and impacts used to determine these scores are discussed in Section 5, Effects of Implementation.

The alternative with the highest weighted score only helps identify the preferred alternative. After this step is complete, the effects, outputs, and differences of each alternative are again reviewed, and the adverse consequences assessed. The final step is to recommend a preferred alternative.

B. Alternative Evaluation

The evaluation criteria discussed in Section 3 were reviewed and four required criteria were identified. All alternatives (including the possible alternative delaying action) were evaluated against the required criteria. Table 8 displays this step.

The delay action alternative is not in compliance with the Wilderness Act or in keeping with Forest Service Policy (see Section 4). It was dropped from further consideration. However, if delaying the decision was selected, the results of this course of action, as displayed in Table 9, would be the same as for Alternative 1. All other alternatives met the required criteria.

TABLE 8 - REQUIRED CRITERIA

	Delay	1	2	3	4	5a	5b	6
Does the alternative comply with the Wilderness Act?	no	yes	yes	yes	yes	yes	yes	yes
Does the alternative comply with Forest Service policy?	no	yes	yes	yes	yes	yes	yes	yes
Does the alternative comply with the Endangered Species Act?	yes	yes	yes	yes	yes	yes	yes	yes
Is the alternative within the Forest Service capability to implement and administer?	yes	yes	yes	yes	yes	yes	yes	yes

In addition six want criteria were identified and ranked in order of importance (Table 9). A relative weight of 10 to 1 (10 being 10 times more important then 1) was assigned to each want criteria.

The impacts to the wilderness user were the most important consideration (10), but evaluation of the areas potential energy resource was of almost equal importance (9).

Because of the wide variety and quantity of big game species affected this criteria was ranked next (6).

Although the impacts on the soil-air-water system were viewed as mostly temporary, any change in the wilderness environment was an important consideration. This criteria was ranked next (4).

Although any action must comply with the Endangered Species Act (required criteria), this is such an important consideration that a want criteria was established to evaluate the alternatives effect on this resource. Its lower ranking reflect compliance with the Act (3).

An equal consideration was the risk of a man caused fire (3). Although many resource management measures have been established to reduce this risk the consequence of a large wild fire is very serious.

Next, a value factor of 10 to 1 (10 being the most favorable, 1 the least favorable, and 0 no significance) was assigned for each of the want criteria for each alternative. These value factors were based on the discussions in Section 4 and 5. The value factors were multiplied by the weights assigned to the want criteria to show the performance value for each alternative. These were added to determine the relative standing of each alternative. Table 9 displays these steps.

TABLE 9 - WANT CRITERIA

WT	EVALUATION CRITERIA	1	2	3	4	5a	5b	6
10	Has the least impact on wilderness user.	*(10) **100	(4) 40	(10) 100	(3) 30	(1) 10	(8) 80	(7) 70
9	Provides for the collection of data of sufficient quality to permit the most orderly and timely evaluation of the nation's potential resource.	(0) 0	(10) 90	(2) 18	(6) 54	(8) 72	(4) 36	(9) 81
6	Has the least impact on big game and fish.	(10) 60	(5) 30	(7) 42	(6) 36	(3) 18	(8) 48	(6) 36
4	Has the least impact on the soil-air-water system.	(10) 40	(7) 28	(8) 32	(1) 4	(6) 24	(9) 36	(7) 28
3	Has the least impact on endangered and threatened species and their habitat.	(10) 30	(7) 21	(8) 24	(5) 15	(2) 6	(4) 12	(5) 15
3	Creates the least fire hazard.	(10) 30	(4) 12	(7) 21	(2) 6	(6) 18	(9) 27	(8) 24
	TOTAL PERFORMANCE VALUE	260	221	237	145	148	239	254

WT - Criteria weight
* (7) - Value factor; 10 best satisfies criteria, 1 least satisfies criteria
** 53 - Performance value; relative score times criteria weight

Alternative 1, No Action, had the highest ranking (260). It causes no additional environmental impacts, but provides no information of the area's energy potential.

Alternative 6, a combination of alternatives 3 and 5b (254), Alternative 5b, Over-The-Snow (239), Alternative 3, Nonwilderness Only (237), and Alternative 2, CGG Proposal (221), had a lower ranking, but all were fairly close. These alternatives were selected for further analysis.

Alternative 5a, Portadrill (148), and Alternative 4, Pack Stock in Wilderness (145), were significantly lower in ranking and were dropped from further analysis.

In order to identify the alternative with the least risk, the adverse consequences of the more favorable alternatives were compared (2, 3, 5b, and 6). Adverse consequences include both the likelihood that a consequence would occur (probability) and the degree of impact that the consequence would cause if it happened (seriousness). Tables 10, 11, 12, and 13, show these steps.

Alternative 1, No Action, was not rated because it would have no additional consequeces, except that no evaluation of the area's energy potential would be made. Alternative 3, nonwilderness only, had the least adverse consequences, Alternative 2, CGG proposal, had some, and Alternative 5a the most adverse consequences.

C. Alternative Selection

Alternative 1 - No Action. Although this alternative has no additional environmental effects it was not selected because seismic exploration in the wildernesses is a legally permitted activity which, as documented in this analysis, can be carried out with few environmental effects in a manner compatible with the preservation of the wilderness environment.

Alternative 2 - CGG Proposal. Although this alternative ranks lower than other favorable alternatives it has less risk. It was not selected because of the heavy impact to the wilderness user.

Alternative 5b - Over-the-Snow. This high ranking alternative had the greatest risk of adverse consequences. With some modifications to reduce these risks, this alternative would be the most preferred. This then, was the basis for the formulation of Alternative 6.

TABLE 10 - EVALUATION OF THE ADVERSE CONSEQUENCES OF ALTERNATIVE 2 (CGG Proposal)

H=High M=Medium L=Low

ALT	EVALUATION CRITERIA	AFFECTED COMPONENT	PROB OF OCCUR (H/M/L)	SERIOUSNESS (H/M/L)
2	Wilderness User	1. Will activity result in a safety hazard for wilderness users?	M	H
		2. Will activity reduce the total use level of wilderness?	L	L
		3. Will activity change Wilderness use patterns?	M	L
		4. Will blasting and helicopter noise reduce solitude?	H	M
	Data Quality & Quantity	1. What probability is there that the exploration will generate poor quality data insufficient for interpretation of the areas geology?	L	M
	Big Game & Fish	1. Will the activity displace big game?	H	L
		2. Will the activity result in big game mortality?	L	L
	Soil/Air/Water	1. Will the activity result in damage to the area's soils?	L	L
		2. Will the activity reduce air quality?	M	L
		3. Will the activity reduce water quality?	L	L
	T & E Species	1. Will the activity displace T & E species?	H	L
		2. Will the activity result in the T & E mortality?	L	M
	Fire	1. Will the activity create a potential for an escaped fire?	M	H

TABLE 11 - EVALUATION OF THE ADVERSE CONSEQUENCES OF ALTERNATIVE 3 (Nonwilderness)

H=high M=Medium L=low

ALT	EVALUATION CRITERIA	AFFECTED COMPONENT	PROB OF OCCUR (H/M/L)	SERIOUSNESS (H/M/L)
3	Wilderness User	1. Will activity result in a safety hazard for wilderness users? 2. Will activity reduce the total use level of wilderness? 3. Will activity change Wilderness use patterns? 4. Will blasting and helicopter noise reduce solitude?	None	None
	Data Quality & Quantity	1. What probability is there that the exploration will generate poor quality data insufficient for interpretation of the areas geology?	H	M
	Big Game & Fish	1. Will the activity displace big game?	M	L
		2. Will the activity result in big game mortality?	L	L
	Soil/Air/Water	1. Will the activity result in damage to the area's soils?	L	L
		2. Will the activity reduce air quality?	L	L
		3. Will the activity reduce water quality?	L	L
	T & E Species	1. Will the activity displace T & E species?	M	L
		2. Will the activity result in the T & E mortality?	L	M
	Fire	1. Will the activity create a potential for an escaped fire?	L	L

TABLE 12 - EVALUATION OF THE ADVERSE CONSEQUENCES OF ALTERNATIVE 5b (Over-the-Snow)

H=high M=Medium L=Low

ALT	EVALUATION CRITERIA	AFFECTED COMPONENT	PROB OF OCCUR (H/M/L)	SERIOUSNESS (H/M/L)
5b	Wilderness User	1. Will activity result in a safety hazard for wilderness users?	L	M
		2. Will activity reduce the total use level of wilderness?	L	L
		3. Will activity change Wilderness use patterns?	L	L
		4. Will blasting and helicopter noise reduce solitude?	H	L
	Data Quality & Quantity	1. What probability is there that the exploration will generate poor quality data insufficient for interpretation of the areas geology?	M	M
	Big Game & Fish	1. Will the activity displace big game?	M	M
		2. Will the activity result in big game mortality?	L	L
	Soil/Air/Water	1. Will the activity result in damage to the area's soils?	L	L
		2. Will the activity reduce air quality?	L	L
		3. Will the activity reduce water quality?	L	L
	T & E Species	1. Will the activity displace T & E species?	L	H
		2. Will the activity result in the T & E mortality?	M	M
	Fire	1. Will the activity create a potential for an escaped fire?	L	L
	Crew Safety	1. Will the winter time activity constitute a major safety hazard for the crew?	M	H

TABLE 13 - EVALUATION OF THE ADVERSE CONSEQUENCES OF ALTERNATIVE 6
(Combination of Alternatives 3 and 5b)
H=High M=Medium L=Low

ALT	EVALUATION CRITERIA	AFFECTED COMPONENT	PROB OF OCCUR (H/M/L)	SERIOUSNESS (H/M/L)
6	Wilderness User	1. Will activity result in a safety hazard for wilderness users?	L	M
		2. Will activity reduce the total use level of wilderness?	L	L
		3. Will activity change Wilderness use patterns?	L	L
		4. Will blasting and helicopter noise reduce solitude?	H	L
	Data Quality & Quantity	1. What probability is there that the exploration will generate poor quality data insufficient for interpretation of the areas geology?	L	L
	Big Game & Fish	1. Will the activity displace big game?	M	M
		2. Will the activity result in big game mortality?	L	L
	Soil/Air/Water	1. Will the activity result in damage to the area's soils?	L	L
		2. Will the activity reduce air quality?	L	L
		3. Will the activity reduce water quality?	L	L
	T & E Species	1. Will the activity displace T & E species?	M	M
		2. Will the activity result in the T & E mortality?	L	L
	Fire	1. Will the activity create a potential for an escaped fire?	L	M
	Crew Safety	1. Will the winter time activity constitute a major safety hazard for the crew?	M	H

7. IDENTIFICATION OF THE FOREST SERVICE PREFERRED ALTERNATIVE

To reduce the risk of Alternative 5b a new alternative, Alternative 6, was developed. This alternative is a combination of Alternative 3 and 5b. It would permit surface charge seismic exploration using helicopters in both wilderness and nonwilderness. However, it would restrict such activity in the wilderness during the heavy visitor use period (June 21 to Nov. 31). This would require CGG to do part of the work during the winter and spring seasons (Dec. 1 to June 20). Seismic exploration of the nonwilderness lands could be done during the summer. Two seasons would be needed to complete the work. Activities in important wildlife habitat and recreation areas would be further restricted. To test this alternative the same process was used. This analysis showed that Alternative 6 had minimal impact on wilderness users, while still providing the opportunity to collect high quality data on the areas potential energy resources (see Tables 9 and 13).

During this analysis it was determined that obtaining information to interpret the area's geology and energy potential was a needed activity in view of the Nation's present energy situation and could be accomplished in a manner compatible with the preservation of the wilderness environment, in conformance with the provisions of the Wilderness Act of 1964, and without unacceptable resource consequences occuring.

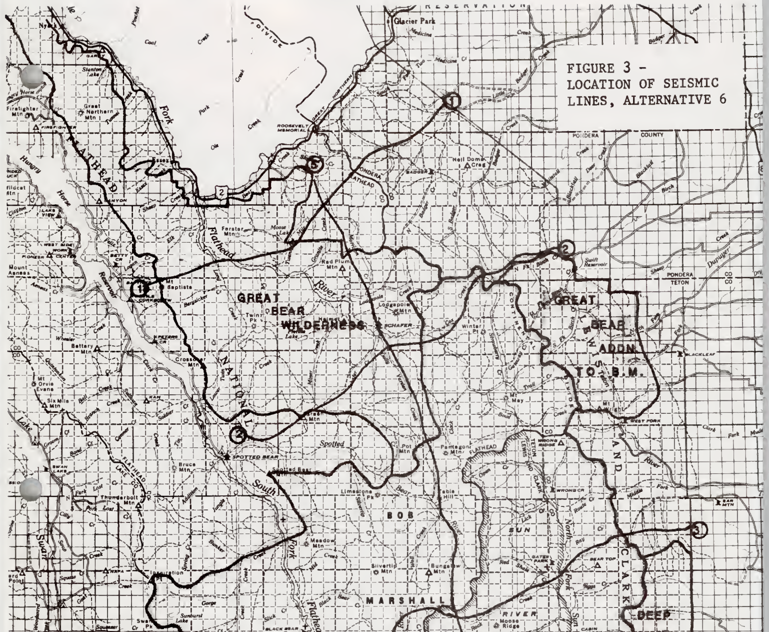
The eastern part of the area is inferred to have a high to moderate potential for natural gas and a low potential for oil (Mudge and others, 1978). The boundaries delineating these zones are arbitary and can be more accurately delineated by seismic surveys (see Fig. 2).

Resource Management Requirements for threatened or endangered species were developed through a review of the scientific literature, personal communications with recognized authorities in the field, and informal consultations with the U. S. Fish & Wildlife Service (11/20/79, 03/19/80, and 03/21/80). These Resource Management Requirements which stringently control the activity, provide for seismic exploration which does not result in a "may affect" situation for the threatened and endangered species which are an integral part of the resources in this area (Holland, 1980, Biologic Exaluation: Appendix D).

Consultation with both the U. S. Geological Survey (Al Balch, personal communication) and CGG confirms that seismic exploration over snow or frozen ground would generate seismic data of sufficient quality to permit interpretation of the area's geology. Operational difficulties and crew safety hazards would be associated with winter season operations in this area. Snow depths greater than 3 feet or noise generated by meltwater percolating down through the snow pack may result in some reduction of data quality. However, because exploration could take place during more than one winter season and because more favorable weather, decreasing snow depths, and bare ground conditions begin in mid-March or early April it is felt that this alternative is both technically and operationally feasible. Implementation of this Alternative would change the exploration costs incurred by CGG and therefore, the costs to the data-user community. Figure 3 shows the location of the seismic lines permitted by Alternative 6.

In addition to the standard stipulations or clauses included in every prospecting permit (Appendix C) all Resource Management Requirements specified in Table 4 would, as appropriate, be added to the prospecting permit or as otherwise required. A performance bond to insure compliance with this permit would be required (FSM 2821.2).

FIGURE 3 - LOCATION OF SEISMIC LINES, ALTERNATIVE 6



LEGEND

②—② SEISMIC LINE

F. P. A.-
FURTHER PLANNING AREA

W. P.- RARE 11
ADMINISTRATIVELY ENDORSED
WILDERNESS PROPOSAL

8. ANALYSIS OF THE SIGNIFICANCE OF EFFECTS

During this analysis the Forest Service received several public comments suggesting that, for a variety of reasons, the proposed seismic exploration is "significant" or a "major federal action" and therefore, the Forest Service should prepare an Environmental Impact Statement. The analysis of the relative significance of the potential effects which may arise from implementation of the Forest Service Preferred Alternative is presented in this section.

The significance of effects is determined through consideration of both "context" (the effects on society as whole, the affected region, the affected interests, and the locality) and "intensity" (the severity of impact). Both short and long-terms effects are relevant (FSM 1950.5). A "major federal action includes actions which are potentially subject to Federal control and responsibility. Major reinforces but does not have a meaning independent of significantly." (FSM 1950.5)

Context

As discussed in preceeding sections winter and spring season seismic exploration in wilderness would result in few socioeconomic effects on the local, regional and national zones. Despite provisions in the Wilderness Act for the use of mechanized equipment, many individuals do not believe that mechanized exploration for minerals or oil and gas is an appropriate wilderness activity. Implementation of Alternative 6 at a time of minimum use by the wilderness visitor should reduce this user conflict. By avoiding most, if not all wilderness user conflicts, winter and spring season (12/1 to 6/20) seismic activity can be "carried on in a manner compatible with the preservation of the wilderness environment" (The Wilderness Act of 1964, Sec. 4(d)(2)).

Exploration activity and any resulting biophysical or socioeconomic effects would be short-term, confined to two winter/spring seasons in wilderness and one summer-season in nonwilderness. Rapid progress along the seismic lines would limit any direct or indirect biophysical effects to a few days or weeks at most. Increased business activity for some communities within the local zone would occur between a two weeks to three months period.

Implementation of Alternative 6 viewed in this "context" is not considered significant.

Intensity

The "intensity" or severity of anticipated benefical or adverse effects which may arise from the preferred alternative must also be evaluated to determine the significance of that action. Public comments along with analysis has defined the important issues or interrelationships which should be examined to determine the relative intensity of effects associated with the implementation of Alternative 6. A discussion of these aspects of relative intensity follows:

1. The degree to which the proposed action affects public health or safety: Seismic exploration as described by Alternative 6 will result in a very low safety hazard for both the nonwilderness and wilderness user. Resource Management Requirements affecting the location, timing, and nature of operations minimize conflict and risk. A crew safety hazard is associated with winter season activity. Snow avalanche hazard persists in some locations into the spring. Winter survival training for the crew and project monitoring greatly reduce these risks. No significant effects are expected to occur.

2. Effect upon unique characteristics, wild and scenic rivers, or ecologically critical areas: The relocation of seismic lines and the restrictions placed on the times that segments of those lines may be used as provided in Alternative 6 will eliminate or greatly minimize the effects seismic exploration will have upon the ecologically critical areas. Full-time on-the-ground supervision of the exploration by the Forest Service will further reduce the possibility that adverse effects to ecologically critical areas will occur. The seismic exploration will have no effect upon the wild rivers of the area (Middle and South Forks, Flathead River). Blasting and helicopters will have a short-term effect upon the solitude of the wildernesses but this will occur at a time when very few people use these areas. No significant effects are expected to occur.

3. The degree to which the effects on the quality of the human environment are likely to be highly controversial: Human environment as used here "shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with the environment. This means that economic or social effects are not intended by themselves to require preparation of an environmental impact statement." (Forest Service NEPA Process, Implementation Proceedures, 1979, p.44723) Thus, only if controversy is related to predicted effects on the human (biophysical) environment will it be considered in determining the significance of the proposed action, and therefore, the need for an EIS.

Most of the public controversy related to the CGG proposal has been based upon the public's perception of mineral and oil and gas exploration as a nonconforming wilderness use rather than on anticipated biophysical effects. This analysis has not predicted that significant biophysical effects will result from implementating Alternative 6. Thus, the controversy associated with this proposal does not seem to be a basis for requiring an EIS.

4. The degree to which the action may establish a precendent for future actions with significant effects or represent a decision in principle about a future consideration: Several of the public commented that the issuing of a prospecting permit was "just the foot in the door" or the first step towards issuing oil and gas leases in the wildernesses. As discussed in Sections 4 and 5 the issuance of a Forest Service prospecting permit is legally separate and divisible from the Forest Service's obligation to make oil and gas lease recommendations to the Bureau of Land Management.

Issuing a prospecting permit does not automatically trigger other actions which may require an EIS. The objectives of a regional seismic investigation extend beyond the area directly explored, thus, a regional seismic survey as in Alternative 6 can be considered independent of a larger action (oil and gas leasing in wildernesses). However, the question of wilderness leasing, which is a question in many peoples minds, is a valid issue which is being evaluated through the compilation of a Forest Plan required by the National Forest Management Act of 1976 or an Environmental Analysis. These analyses will be released during 1981.

5. The degree to which the action may adversely affect endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973: Alternative 6 prohibits seismic exploration on occupied grizzly spring range and denning habitat while in use. Seismic exploration during the summer and fall in nonwilderness areas, prior to hunting season is not expected to effect the grizzly. Similarly, winter and spring season activity as controlled by the Resource Management Requirements has been determined not to result in a "may affect" situation for the grizzly.

The gray wolf is a widely dispersed and mobile species. It has been determined that seismic activity will not result in a "may affect" situation for this species.

6. Does the action threaten a violation of Federal, State, or local law: Montana statutes governing the creation and general operation of game preserves state (87-5-401): "Within the limits of a preserve, a person may not carry or discharge firearms, create any unusual disturbance tending to frighten or drive away game animals or birds, or chase them with dogs."

The Sun River Game Preserve located within the Lewis & Clark National Forest portion of the Bob Marshall Wilderness is closed to all hunting. The creation of this game preserve however, creates no encumbrance on the federal minerals which lie within its boundaries, nor does the statute creating the game preserve modify federal laws governing exploration foror disposal of those mineral or energy resources.

Alternative 6 provides for seismic exploration across the Sun River Game Preserve during the period from 12/1 to 6/20. During this time period elk and other big game wildlife use of the area is negligible. Thus, seismic exploration of this game preserve can be done in a manner which does not violate the spirit or intent of the statute and no significant effects are anticipated from implementing Alternative 6.

9. CONSULTATION WITH OTHERS

A. Consultation with the Public

On November 19, 1979, the Lewis & Clark and the Flathead National Forests issued a news release to initiate public involvement concerning the CGG proposal. The news release was sent to the Forests' regular media mailing lists. The release discussed the proposal, the study procedure, and announced open houses to be sponsored by both Forests. Media representatives were specifically invited to attend the open houses.

Open Houses

On November 26, 1979 open houses were held on both Forests from 1:00 to 5:00 PM, and 7:00 to 9:00 PM. A slide program was presented showing the seismic exploration procedure. The photographs were taken by Forest Service personnel when CGG was doing seismic exploration on the Lewis and Clark National Forest in Summer 1979. Following the slide program there was a question and answer period. Participants were encouraged to voice issues and concerns and were invited to respond in writing. Fact sheets and response sheets were handed out at the open houses.

A total of 39 people attended the Flathead open house including 4 media representatives. A total of 49 people attended the Lewis & Clark open house including 3 media representatives. Also on November 26, the Flathead Forest presented the slide program and had a discussion with members of the Flathead River Basin Environmental Impact Study Steering Committee.

Identification of Public Issues

By December 12, 1979 49 written responses concerning the proposal were received. The following issues resulted directly from analysis of these written responses and verbal comments made at both open houses.

1. Will this proposal lead to further exploration and development?

2. Does the proposed seismic exploration:
   - -Meet existing statutes and Forest Service policy?
   - -Conform with the public's perception of wilderness uses?

3. Does the proposed seismic exploration provide for an orderly and timely evaluation of the Nation's potential energy resources?

4. What effects would the proposed seismic exploration have:
   - -On threatened or endangered species (grizzly bear, gray wolf, bald eagle, and peregrine falcon) and on big game (elk, moose, bighorn sheep and mountain goats) and fish?
   - -On the areas vegetation and the soil-air-water system?

5. What effects would occur if mechanized equipment were not used?

6. What effects would the noise from explosives and helicopters have on:
   - Recreation use of the Wilderness?
   - Safety of wilderness user?

7. What potential fire hazards are involved with the proposed type of seismic exploration?

8. Is the proposed action within the Forest Service's capability to implement and administer?

During the months of December 1979 and January 1980, representatives from the Flathead National Forest showed the slide program and discussed the proposed seismic exploration with several groups. About 500 people attended these presentations. The groups included:

Montana Dept. of Fish, Wildlife and Parks, Kalispell, Dec. 3, 1979
Montana Wilderness Association, Kalispell, Dec. 7, 1979
Flathead Wildlife Incorporated, Kalispell, Jan. 10, 1980
Professional Wilderness Outfitters, Kalispell, Jan. 11, 1980
Several Service Organizations, Kalispell, throughout

Between Dec. 12, 1979 and Jan. 31, 1980, an additional 21 letters were received concerning the proposal. Many of these letters come from individuals and groups that learned about the CGG proposal from presentations made by Flathead Forest representatives.

Announcement of Public Issues, Management Concerns and Alternatives

On February 1, 1980 a letter was sent to over 250 individuals and organizations on a mailing list developed from the following sources: those who attended the open houses; those who asked for further information or were known to be interested in oil and gas issues; those who have special use permits in the Bob Marshall and Great Bear Wilderness; and those who have applied for oil and gas leases in these wildernesses.

The letter, dated January 31, 1980, included:
general information about the CGG proposal;
the list of issues developed from verbal and written comments;
the alternatives identified for further study;
a display of the study procedure and probable time frame for completing the analysis; and
an invitation to comment on information in the letter by February 14, 1980.

On February 1, 1980 another news release was sent to media on the Forests' mailing list. The release summarized issues identified by the study team, described the proposal, and gave a short summary of progress of the study.

Public Response to Issues, Management Concerns and Alternatives

Between February 1 and February 19, 1980, two petitions and 59 additional letters were received concerning the proposal.

One petition with 130 signatures stated "that a continuation of the present wilderness management is the best policy for preserving the wilderness characteristics for which these areas were established." The other petition, with 102 signatures, opposed the proposal because of wildlife and recreation values of the wilderness.

Of the 59 letters received, 36 were from individuals, 9 were from environmental/conservation organizations, 6 were from business/industry, 6 were from wilderness special use permittees, and 2 were from oil and gas lease applicants. Many respondents gave opinions on some or all of the issues and management concerns identified from earlier public involvement. Many respondents were concerned that if the exploration showed good potential for oil and/or gas, the Forest Service would be under great pressure to recommend full scale development. Several respondents felt the actual adverse physical and biological impacts of the seismic activity would not be very great, but impacts on wilderness users would be substantial. Several respondents questioned whether the proposed exploration actually complied with the intent of the Wilderness Act.

Some additional concerns that surfaced and were discussed by the study team included: that the Middle and South Forks of the Flathead River are in the National Wild and Scenic River System; the economic impacts of the proposal; the possibility of avalanche and/or rockslides from the proposed activity; and the effects on wildlife other than those listed in the wildlife issues.

Considering the alternatives, 50 of 59 respondents endorsed the no action alternative, 8 endorsed permitting the exploration as requested with appropriate restrictions, and 1 respondent gave no preference. The reasons respondents gave for supporting specific alternatives were generally related to how they viewed the issues.

Comments on the study procedure were also made by several respondents. Five respondents felt the study was being done too fast, and there should be more opportunity for public comment. Ten respondents felt a draft and final Environmental Impact Statement (EIS) should be prepared. Some felt the EIS should include the impacts of potential future action on oil and gas leases and further development. These respondents felt the scope of the proposal should include more than just taking action on the CGG prospecting request.

For a summary of sample responses used in 131 response forms and letters received by February 19, 1980 see Table 14.

TABLE 14 - A SUMMARY OF PUBLIC RESPONSES TO THE CGG SEISMIC EXPLORATION PROPOSAL

Viewpoints and Frequency:	Sample of Comments
a. Wilderness exploration should be permitted (as explained in alternative 2 or 4).	-Mining activity is authorized by the 1964 Wilderness Act. -We need the data on petroleum potential to facilitate resource decisions. -Exploration will not permantly harm the wilderness environment. -We need reliable domestic petroleum supplies. -Exploration now can be leisurely and carefully conducted; in the face of future shortages it may been hastily done. -Oil and gas activities can be consistent with Forest management policies and natural values. -CGG will do a more careful job than several individual companies or a Federal agency. -Might find there are no petroleum reserves and leave wilderness alone. -Development of a discovery would boost the economy.
b. Wilderness exploration may be permissible if certain conditions are met.	-Explorationists should observe the same restrictions as other wilderness users; FS should educate them on wilderness values. -If it is part of a coordinated energy plan which includes conservation, utilizes alternative fuels, and taps nonwilderness sources first. -Issue should be settled in advance: either we will permit some development and now explore, or development will be prohibited and exploration is unnecessary. -Entire exploration and development process should be analyzed at once in an EIS. -There must be close Federal supervision of all phases of activity. -First must assess possible adverse economic impacts, e.g., on tourism. -The present decision period is too short to permit adequate evaluation.

TABLE 14 con't

Viewpoints and Frequency:	Sample of Comments
c. Permission for wilderness exploration (as characterized in alternatives 2, 4, or 5) should be denied.	-Forest Service should assume responsibility to protect wildernesses and select "No Action" alternative. -Noise will frighten wildlife, interfere with mating patterns, drive grizzly bears outward. -In the past, not even government construction and resource protection activities have utilized nonmanual equipment in wildernesses. -If exploration results are encouraging, pressure will mount for petroleum development and production. -This generation has used more than its share of petroleum; save wilderness resources for the future and improved technology. -Explosives may pollute streams, cause fires, harm wilderness users. -Two helicopters and 30 workers will add significantly to physical impacts on fragile mountain environment. -Any type of industrial activity is simply inconsistent with the concept of wilderness, as wilderness is defined in the 1964 Act. -A petroleum discovery would lead to the irreversible destruction of portions of the wilderness. -Ours is a wasteful society; wilderness gas or oil is not really needed, would be quickly used up. -Wilderness values are precious and worth more than any quantity of gas or oil that may be found. -The Bob Marshall is the crown jewel of American wildernesses. -A bad precedent for other wildernesses. -Congressional provision for wilderness mining did not intend to permit large-scale activity inconsistent with wilderness values. -Forest Service lacks resources for close supervision on this scale. -Don't trade an eternal resource for an expendable one. -Sixty pack horses would be even more impactive than helicopters. -CGG estimates of time and impacts are understated. -These activities will interfere with wilderness recreation.

Continued Public Comment

Additional letters were received after the announced comment period on issues, management concerns and alternatives ended on February 14, 1980. By March 10, 1980, 87 additional letters were received. Eighty-three respondents were opposed to the proposed exploration, three approved it, and one was neutral. Twelve letters came from out-of-state and seventy-five came from in-state sources.

Between March 10, 1980 and March 26, 1980 181 additional letters and 7 petitions were received. The letter and petition respondants were opposed to granting the prospecting permit. The letters came from 111 in-state respondants, 50 out-of-state respondants, and 11 from unknown sources. The 7 petitions had a total of 244 signatures. Two of the petitions originated in the Missoula area, and 5 originated in the Flathead Valley.

The CGG mailing list is in Appendix E. The list includes those who were sent the January 31 letter, and those who have responded since then. Over 100 additional letters were after March 26, 1980. These names do not appear on the mailing list in Appendix E. Notification of the decision reached on this analysis will be mailed to those on the mailing list and others who have subsequently expressed interest.

B. Consultation With Other Agencies

Most of the consultations were related to fish and wildlife topics. Discussions were held with biologists from the U.S. Department of Interior, Fish and Wildlife Service. Discussions with several biologists from regions one and four of the Montana Department of Fish, Wildlife and Parks were also initiated.

Consultations with the U.S. Department of Interior, Geological Survey occured several times during the study. This included discussion of agency participating in some way with any possible private seismic exploration. The topic resulted from public concern that a public agency should have access to information from any possible seismic exploration.

10. APPENDIX

A. References Cited

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15. Mudge, M.R., and others, 1978, Mineral Resources of the Bob Marshall Wilderness and Study Areas, Lewis and Clark, Teton, Pondera, Flathead, Lake, Missoula, and Powell Counties, Montana: U.S. Geol. Survey Open-File Rept. 78-295, 187p.

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18. USDA, Forest Service, 1974, Lewis & Clark National Forest Multiple Use Plan, Part 1, 72p.

19. USDA, Forest Service, 1974, Flathead National Forest Multiple Use Plan, Part 1, 46p.

20. USDA, Forest Service, 1976, Oil and Gas Lease Applications, Exploration and Development: Flathead National Forest, Final Environmental Statement, 97p.

21. USDA, Forest Service, 1977, Rocky Mountain Front Planning Unit: Lewis & Clark National Forest, Draft Environmental Statement, Pt. 1.

22. USDA, Forest Service, 1979, Roadless Area Review and Evaluation, Final Environmental Statement, 113p, appendices.

23. USDA, Forest Service, 1979, National Environmental Policy Act Process; Final Implementation Procedures: F.R., v.44, n.147, p. 44718-44738.

APPENDIX

B. Interdisciplinary Team Membership

1. Deist, Jay - Issues and Concerns on Fire and Public Safety.
   - Assistant Fire Management Officer, Hungry Horse Ranger District, Flathead National Forest

2. Flint, Fred - Issues and Concerns on Recreation and Wilderness.
   - Resource Assistant, Spotted Bear Ranger District, Flathead National Forest

3. Holland, Tom - Issues and Concerns on Wildlife and Threatened or Endangered Species.
   - Wildlife Biologist, Supervisor's Office, Lewis & Clark National Forest.

4. Morrison, Art - Public Information
   - Public Information Specialist, Supervisor's Office, Flathead National Forest

5. Smith, Dick - Analysis Proceedures and Management Coordination
   - Land Use Planner, Supervisor's Office, Flathead National Forest

6. Swanger, LLoyd - Management Coordination.
   - District Ranger, Rocky Mountain Ranger District, Lewis & Clark National Forest

7. Weber, Mark - ID Team Leader, Issues and Concerns on Minerals and Geology.
   - Geologist, Supervisor's Office, Lewis & Clark National Forest

C. USDA, Forest Service, Prospecting Permit

UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE **PROSPECTING PERMIT** (Act of June 4, 1897) (Ref: FSM 2821)	FILE REFERENCE NAME OF PERMITTEE DATE OF APPLICATION

Permission is hereby granted to ____

of____

to use the following-described lands: ______________________________________
(Describe the lands to be occupied with reference to a Government survey,

____
State-grant road, stream, or well-known landmark)

____

____

____

____

____

____

for the purpose of making excavations, drilling shot holes, or doing other work thereon necessary for determining whether there are mineral deposits of such a quantity and value as would warrant application to the Bureau of Land Management, Department of the Interior, for a prospecting permit granting a preference right to lease or a mining lease authorizing exploitation and development of the mineral resources; and erecting such temporary structures and facilities as are requisite thereto.

This permit is granted subject to all valid claims to the described lands, and to the following conditions:

1a. The permittee shall pay in advance to the Forest Service, U. S. Department of Agriculture, an annual rental in the sum of $______________.*

1b. The permittee shall pay to the Forest Service, U. S. Department of Agriculture, the sum of $__________ __________ for each shot hole drilled, such payments to be tendered in advance of drilling in units of five or more, except for a final or single payment, which may be for one or more holes.*

*Strike out 1a or 1b, whichever is inapplicable.

2. The permittee, in exercising the privileges granted by this permit, shall comply with the regulations of the Department of Agriculture and all Federal, State, county, and municipal laws, ordinances, or regulations which are applicable to the area or operations covered by this permit, including, but not limited to, those pertaining to fire, sanitation, fish, and game.

3. This permit is accepted subject to the conditions set forth herein, and to conditions __________ to ______________________________ attached hereto and made a part of this permit.

PERMITTEE	NAME OF PERMITTEE	SIGNATURE OF AUTHORIZED OFFICER TITLE	DATE
ISSUING OFFICER	NAME AND SIGNATURE	TITLE	DATE

(CONTINUED ON REVERSE)

4. This permit does not grant any exclusive right to the use of the described lands for prospecting, or other purposes; the area herein described shall be subject at all times to any other lawful uses by the United States, its lessees, permittees, licensees, and assigns.

5. This permit does not grant any rights of any kind in minerals; nor does it grant any preference right of any nature whatsoever in the issuance of a permit or lease for the exploration, removal, or development of the mineral resources in the described lands.

6. The permittee shall take all reasonable precaution to prevent and suppress forest fires. Particularly in connection with operations under this permit, fire prevention and fire-fighting equipment as required by the Forest Supervisor shall be provided, and the burning or other disposal of brush and other inflammable debris shall be done by the permittee in accordance with written stipulations to be issued by the Forest Supervisor.

7. No national forest timber may be cut or destroyed without first obtaining a permit from the forest officer in charge.

8. The permittee will exercise diligence in protecting from damage the land and property of the United States covered by and used in connection with this permit and will pay the United States for any damage resulting from the violation of the terms of this permit or any law or regulation applicable to the national forests by the permittee, his agents, or employees, or through negligence of the permittee, his agents, or employees, when acting within the scope of their employment.

9. The permittee shall safeguard with fences, barriers, fills, covers, or other effective devices, any shafts, pits, tunnels, cuts, and other excavations which otherwise would unduly imperil the lives, safety, or property of other persons.

10. Upon abandonment, termination, or revocation of this permit, the permittee shall remove all structures and facilities which have been placed on the premises by him, and shall restore the site, unless otherwise agreed upon in writing or in this permit.

11. This permit may be terminated upon breach of any of the conditions herein or at the discretion of the Forest Supervisor or Regional Forester.

12. The permittee shall fully repair all damage, other than ordinary wear and tear, to roads and trails in the national forests caused by the permittee in the exercise of the privilege granted by this permit.

13. In case of change of address, permittee shall immediately notify the Forest Supervisor.

14. No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this permit or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this permit if made with a corporation for its general benefit.

15. The conditions of this permit are completely set forth herein and none of its terms can be varied or modified except in writing by the forest officer issuing the permit, his successor, or superior, and in accordance with applicable law and the regulations of the Secretary of Agriculture.

16. In the event of any conflict between any of the preceding printed clauses or any provision thereof and any of the following clauses or any provision thereof, the following clauses will control.

D. Biological Evaluation - Endangered Species Requirements

Threatened and Endangered Species Habitat

The grizzly bear (Ursus arctos), gray wolf (Canis lupus) and bald eagle (Haliaeetus leucocephalus) occupy habitat within or adjacent to the Lewis and Clark and Flathead National Forest upon which this prospecting permit has been filed. The peregrine falcon (Falco peregrinus) may use portions of the area to a limited extent, probably during the non-breeding season. Under the provisions of the Endangered Species Act of 1973 these four species were classified by the U.S. Fish and Wildlife Service as either threatened or endangered depending on their current population status. These species are discussed seperately as they relate to the proposed seismic prospecting permit.

Bald Eagle - Endangered Species

Bald Eagles use the area to a limited extent, mostly on a seasonal basis during the spring and fall migration period. The only known nest occurs approximately 9 air miles from the nearest proposed activity. Suitable-occupied essential habitat for the bald eagle has been delineated by the Forest Service around Hungry Horse Resorvoir, on the South Fork of the Flathead River upstream to Spotted Bear, and on the Middle Fork of the Flathead River (Forest Service, 1978a). These areas are just outside the area proposed for seismic exploration. Should additional important bald eagle habitat within the area of consideration be located prior to or during the proposed activity this habitat will be provided immediate protection by Resource Management Requirement No. 86. It is therefore the conclusion of this evaluation that a "may affect" situation does not occur with this species as it relates to the proposed activity.

Peregrine Falcon - Endangered Species

Suitable-unoccupied essential habitat for the peregrine falcon has been delineated by the Forest Service around some of the major cliff habitats throughout the area covered by this evaluation (Forest Service, 1978b). No peregrine falcon nests or sustained peregrine activity has been recorded in these areas. Should sightings or nests be observed prior to or during the proposed activity this habitat will be provided immediate protection by Resource Management Requirement No. 86. Because of a lack of activity and the absence of known nests it is the conclusion of this evaluation that a "may affect" situation does not occur with this species.

Gray Wolf - Endangered Species

Except for an area along th Rocky Mountain Front east of the Continental Divide and south of Gibson Resorvoir the entire area covered by this evaluation has been delineated by the Forest Service as occupied essential habitat for the gray wolf (Forest Service, 1980). The Bob Marshall area has been identified as an area where natural wolf recovery could take place. Wolves south of Highway 2 may be permanent residents of the area (Wolf Ecology Project, 1979). The sporadic nature of reported wolf activity and the high incidence of single wolves being sighted would indicate that the wolf population is low and that pack formation is not occuring at the present time (Mattson and Ream, 1978).

Wolves in the area apparently cover large areas and are dependent on the plentiful big game herds as its prey base food source. Should any wolf den, pups, or wolf pack activity be observed prior to or during the proposed activity this species and its habitat will be provided immediate protection by Resource Management Requirement No. 86. Because the gray wolf is widely dispersed throughout the area, is highly mobile if indeed encountered, and the prey of this species is be protected by Resource Protection Requirements and hunting seasons, it is the conclusion of this evaluation that a "may affect" situation does not occur with this species as it relates to the proposed activity.

Grizzly Bear - Threatened Species

The entire area under consideration, except for 3 areas along the eastern boundary of the Lewis and Clark National Forest, has been delineated by the Forest Service as occupied essential habitat for the grizzly bear. The grizzly bear is found within this area on a year long basis. The population is estimated to be 279 bears (1 bear/31 square miles) based on recent grizzly bear studies within the ecosystem (Personal communication; Servheen, Border Grizzly Project, 1980). Because the grizzly bear has a large home range territory it is relatively safe to say that a high percentage of the total number of bears use the area covered by this evaluation for at least a portion of their life.

The grizzly bear is most vulnerable to human disturbance during the spring after emergance, in the late fall, and during the denning period. Spring ranges are considered to be low elevation areas that contain desirable succulent vegetation during April, May, June and early July that are immediately utilized by bears after they emerge from their dens. Fall ranges are considered to be areas high in the production of fruits and seeds that bears need for gaining weight before winter denning. Denning habitat in the Bob Marshall ecosystem has been identified as areas that are generally: over 6,000 feet in elevation, near ridgetops or treeline, on open or scattered timber steep slopes, usually near an alpine basin, and within the Abies laciocarpa habitat types with Cryochrept group soils (Jonkel, 1977). Although uncommon, a few cases do occur where dens are made in other habitat types or at lower elevations (Personal communication, C. Jonkel 1980).

Grizzlies enter dens in late November regardless of weather conditions and emerge from dens between late March and early May (Jonkel, 1978).

Generally most grizzly bears (95%) are out of their dens by the end of April (Personal communcation, C. Jonkel, 1980). Because these habitats and time periods are very important to the grizzly bear some special Resource Management Requirements have been developed to protect the bear and its habitat. These are:

#79 Prohibit activities on occupied grizzly range from 3/15 to 7/1.
#85 Prohibit activities on and one mile either side of identified grizzly denning habitat from 11/15 to 5/10.
#32 Prohibit operations during the period ten days prior to the start of big game season through the end of the big game season (This protects fall grizzly range).
#86 Require that seismic lines be relocated to preserve special wildlife habitats when they are encountered or identified prior to activity. These special habitats include but are not limited to, wallows, mineral licks, waterholes, bedding sites, nests, and dens.

Because of the sensitive nature and importance of spring and fall ranges of the grizzly bear, no activity will occur on these ranges while the bears are occupying them. Because of the obvious importance of dens to the grizzly bear these seismic lines travelling across denning habitat or one mile either side of this habitat (to provide a buffer zone for noise reduction) will not be run until after the bears have emerged and moved to low elevation spring range which is almost always by May 10. Although the vast majority of bears move to lower elevations following emergence from dens, occassionally bears (usually a female with cubs) will remain in a high secluded basin near their den after May 10th if the basin provides a good feeding area (Personal communication, C. Jonkel, 1980). To insure that no disturbance will occur to a female with cubs in this situation the denning habitat will be closely surveyed prior to any activity moving into the area to determine if any family group are remaining within any high basin.

If a family group was located in one of these areas the seismic activity would be postposed until a later date to avoid disturbing these bears. Should any additional important grizzly bear habitat be identified at a later date, prior to or during the proposed activity, this habitat will be provided immediate protection by Resource Management Requirement No. 86. Because all important grizzly habitat currently identified and areas identified in the future will be protected by Resource Management Requirements it is the conclusion of this evaluation that a "may affect" situation does not occur at the time this evaluation is prepared. Should any unavoidable adverse effect, unknown at this time, be determined by our monitoring efforts or identified during or prior to the seismic operation a "may affect" determination may be made and formal consultation with the U.S. Fish and Wildlife Service will be initiated.

Summary

A large portion of the proposed seismic exploration proposal occurs within identified occupied essential habitat of the grizzly bear and gray wolf. The area under consideration also lies adjacent to occupied essential bald eagle habitats and small portions lie within suitable unoccupied habitat of the peregrine falcon. It is the conclusion of this evaluation that the proposed seismic exploration, performed in strict adherence to all the Resource Management Requirements developed through the environmental analysis, coupled with protection of important habitat identified now or later, will not result in a "may affect" situation for any of the threatened or endangered species occuring in the area. As a result of this determination, formal consultation will not be initiated with the U.S. Fish and Wildlife Service. This is in compliance with procedures outlined between the USDA, Forest Service and U.S. Fish and Wildlife Service on June 29, 1979. It should also be understood that if any threatened or endangered species are located where not previously known, or any unanticipated adverse impacts develope, a "may affect" situation might then be initiated. No other threatened or endangered species or species proposed for listing are known to occur in this area at the present time. Any future seismic operations or any other additional activity proposed for this area will require an environmental analysis and another biological evaluation or assessment. Endangered and threatened species concerns may preclude, modify or restrict future activities in this area so as to protect and maintain threatened and endangered species and their habitat.

Prepared by Thomas M. Holland 03/27/80
ID Team Wildlife Biologist Date

Approved by Kenneth D. Weyer 4/7/80
Forest Supervisor - Lewis & Clark NF Date

Approved by 4/7/80
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